21 SEPTEMBER 1961

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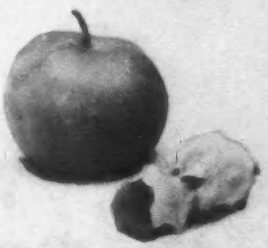
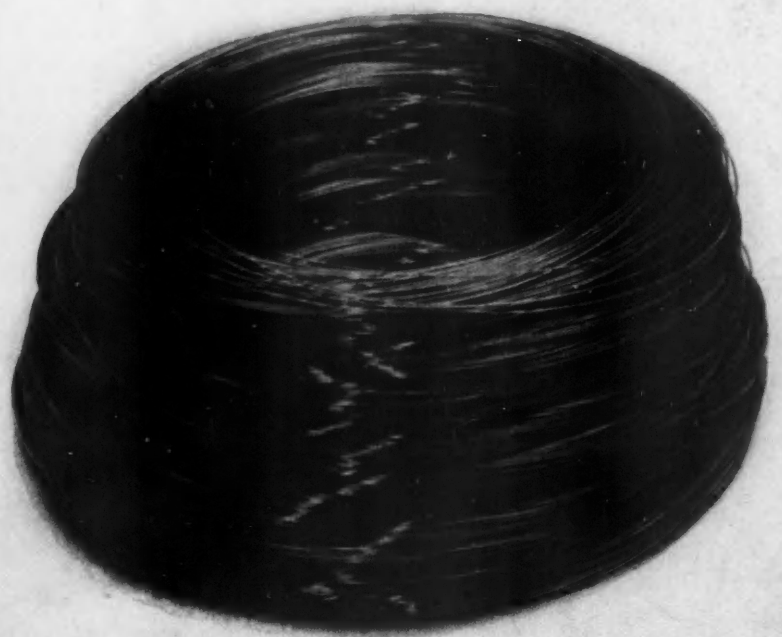




Cablemaking today
is largely a matter
of research, experience,
materials, and methods
of quality control—
many of which we have
pioneered ourselves.
But the core of a cable
is copper wire.
So we start with
a further advantage . . .
even the copper is refined
and drawn
under our own control.

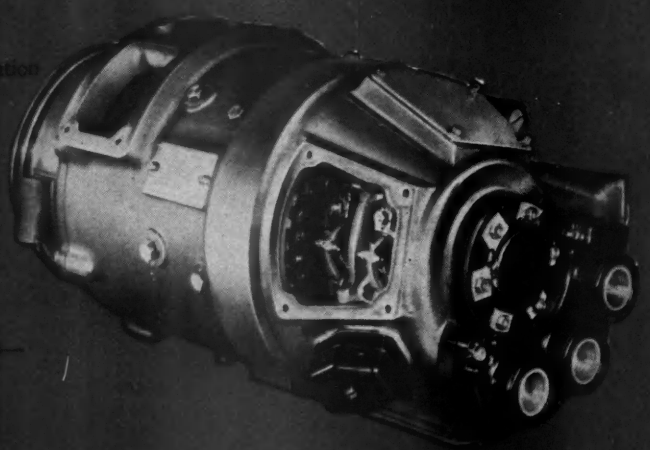
BICC

Cablemakers - from start to finish !

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY ST., LONDON, W.C.1

WITH ONE MATERIAL OR ANOTHER...

M & I combination insulation is used in the A.E.I. salient pole alternator for the Comet 4 jet aircraft. Photograph by courtesy of A.E.I. Motor & Control Gear Division.



We make a wide range of combination insulation—Flexible Micanite or Samicanite, backed on one or both sides with cotton or nylon or "Terylene" or silk or paper or glass or "Melinex" film or Leatheroid and other materials—FLEXIBLE, MECHANICALLY STRONG, WITH GOOD ELECTRIC STRENGTH—FOR SLOT INSULATION.

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m and i

the electrical insulation people

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EMPIRE WORKS, WALTHAMSTOW, LONDON, E.17

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"Terylene" & "Melinex" are registered trade marks of I.C.I.

a rural transformer of unique design

PRESSED STEEL CONSTRUCTION

The tank of this latest 'ENGLISH ELECTRIC' 5 kVA transformer is made of two robust steel pressings which are welded together, forming a single, completely sealed unit and is suitable for use on systems up to and including 11 kV.

Other features include:

- ★ All bushing gaskets under oil
- ★ Breather can be fitted if required
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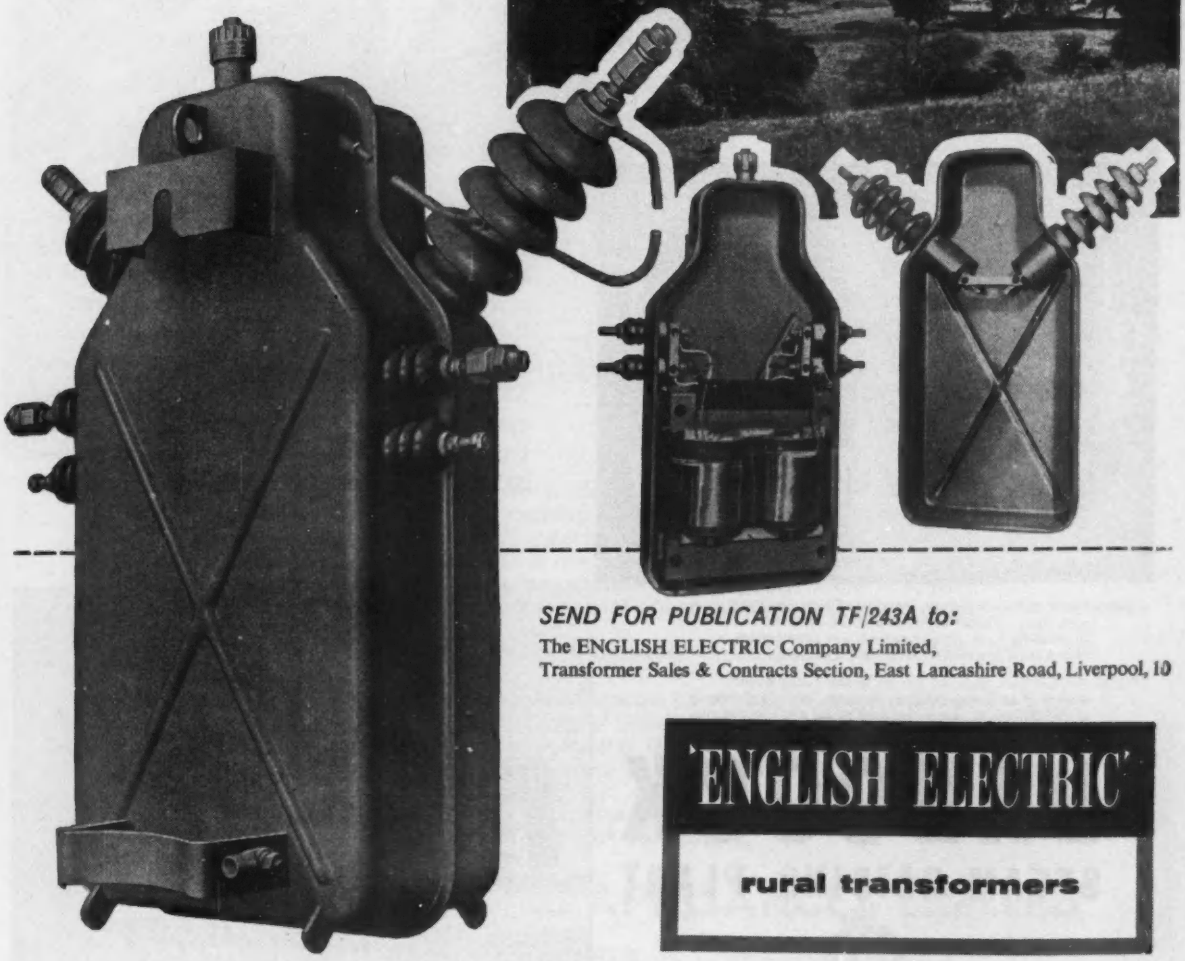

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The ENGLISH ELECTRIC Company Limited,
Transformer Sales & Contracts Section, East Lancashire Road, Liverpool, 10

'ENGLISH ELECTRIC'

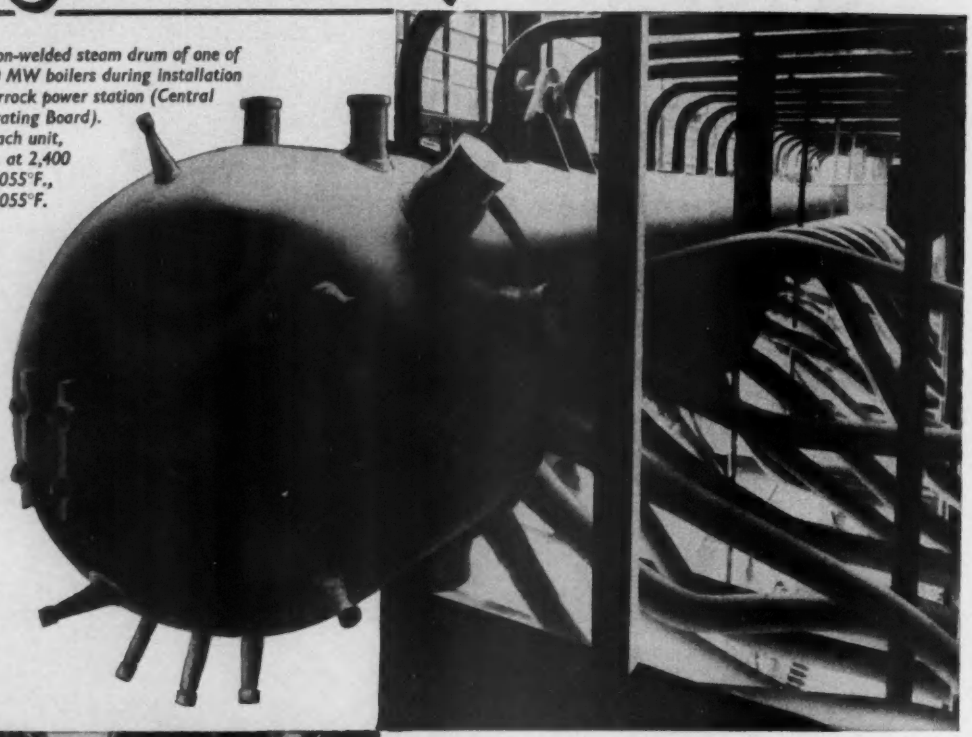
rural transformers

The English Electric Company Limited, English Electric House, Strand, London, W.C.2

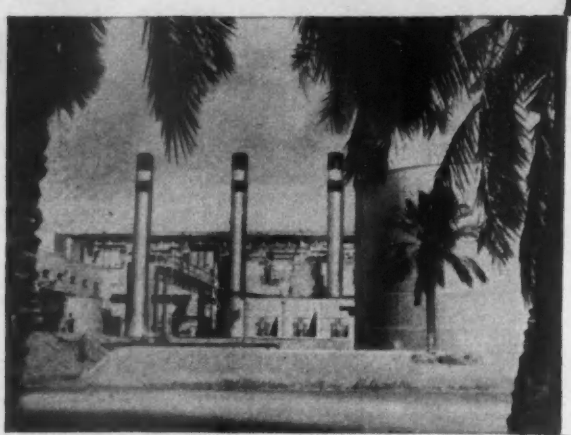
TFL.47A

A

Meeting World-wide power demands



The 155-ton fusion-welded steam drum of one of two Babcock 200 MW boilers during installation at the West Thurrock power station (Central Electricity Generating Board). Evaporation of each unit, 1,350,000 lb./hr. at 2,400 lb./sq. in. and 1,055°F., with reheat to 1,055°F.

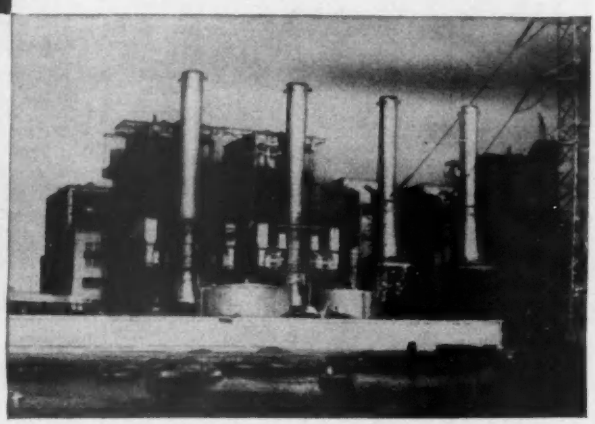


STEAM is, by far, the world's most important medium for electrical-power generation and a very high proportion of the world's power stations is equipped with BABCOCK steam-raising plant.

Recent contracts for home and overseas central station boilers include units of 200, 300, and 550 MW capacity, a number to operate on a reheat cycle, and a 375 MW boiler of the "once-through" type to generate steam at super-critical pressure—3650 lb./sq. in. and 1110°F. with reheat to 1055°F.

(Above) Power station at Basrah, Republic of Iraq, equipped with three 165,000 lb./hr. BABCOCK Type FH Integral-Furnace, oil and natural-gas fired boilers. (Consulting Engineers : Ewbank & Partners).

(Right) VENEZUELA. Babcock boilers at the Tacoa power station of La Electricidad de Caracas, including units of 550,000 lb./hr. capacity, fired by oil and natural gas. (Consulting Engineers : Sofina).



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ELECTRIC
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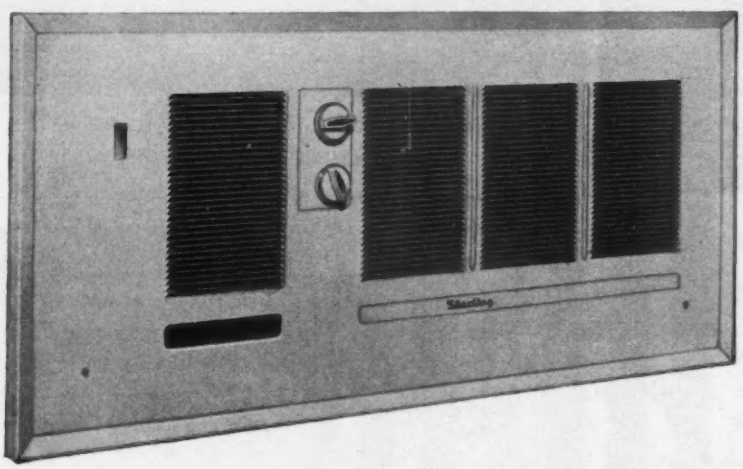
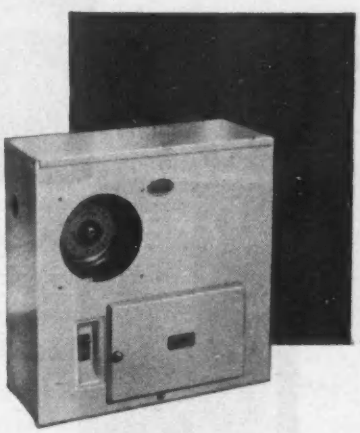
SPACEHEATER





Up to now the electricity world has had no adequate system to offer in competition with the central heating advertising campaigns currently in force by the Coal, Gas and Oil industries.

The Sterling AXIATHERM is the Electrical Trade's answer to the ever growing demand for central heating in the home, shop and office. A system based on the cleanest, most efficient and cheapest heating medium available today—Electricity.

It is new in conception, brilliantly designed, precision built and simplicity itself to install.

The AXIATHERM is a packaged system consisting of any number of spaceheaters wired to a central Control Unit incorporating a time clock for economy of operation. Each spaceheater is individually thermostatically controlled to provide higher efficiency of individual room temperature control combined with greater economy.

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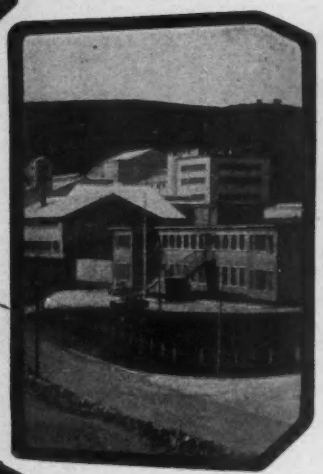

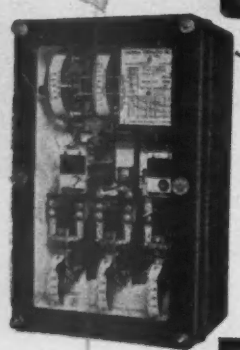

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protection against phase failure, overload, short circuit, earth fault.
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give complete protection against stalling under all conditions.
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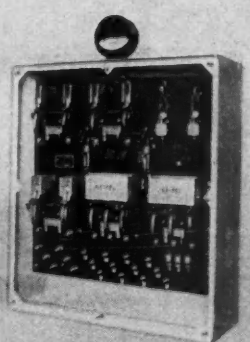

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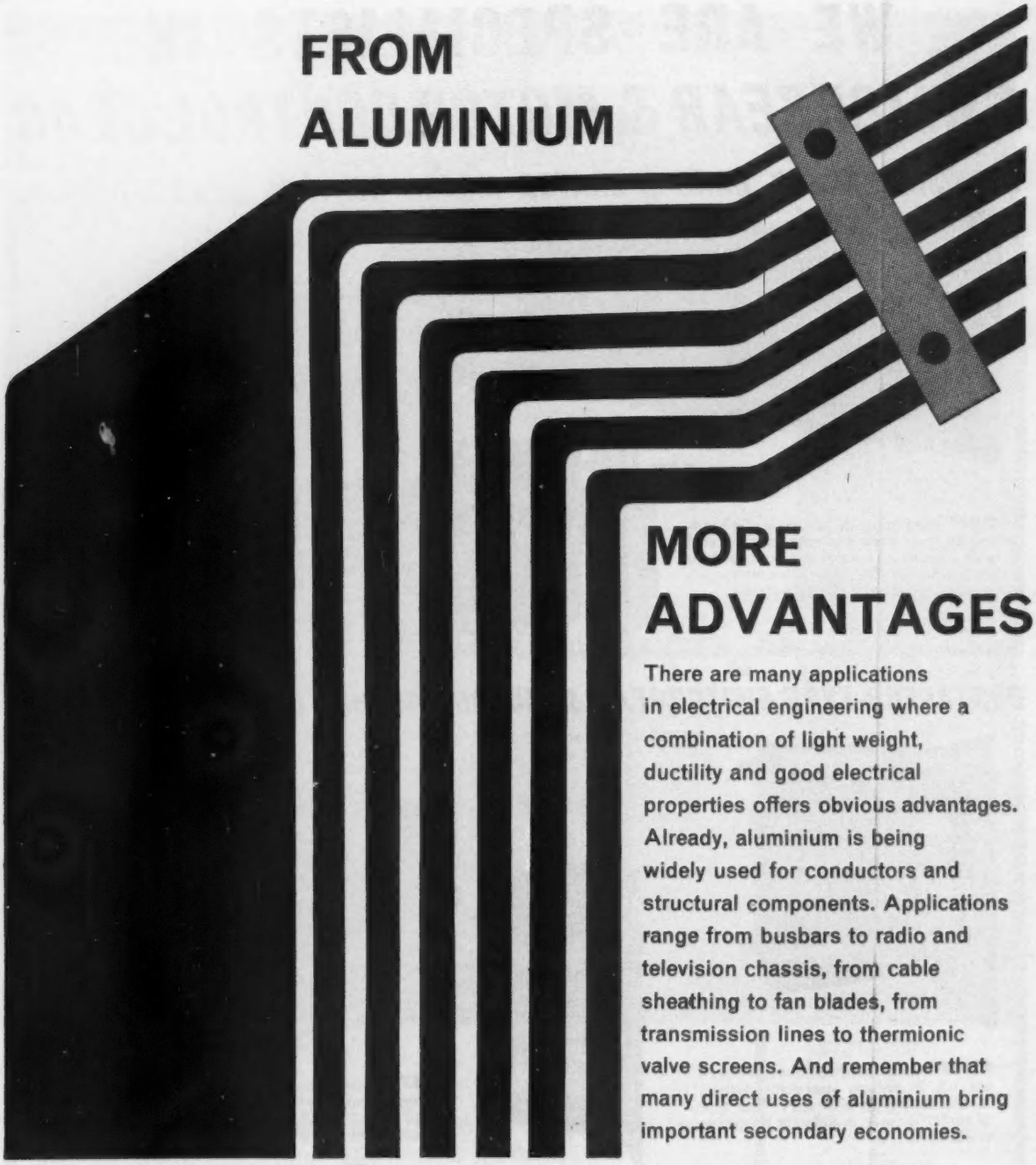

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There are many applications in electrical engineering where a combination of light weight, ductility and good electrical properties offers obvious advantages. Already, aluminium is being widely used for conductors and structural components. Applications range from busbars to radio and television chassis, from cable sheathing to fan blades, from transmission lines to thermionic valve screens. And remember that many direct uses of aluminium bring important secondary economies.

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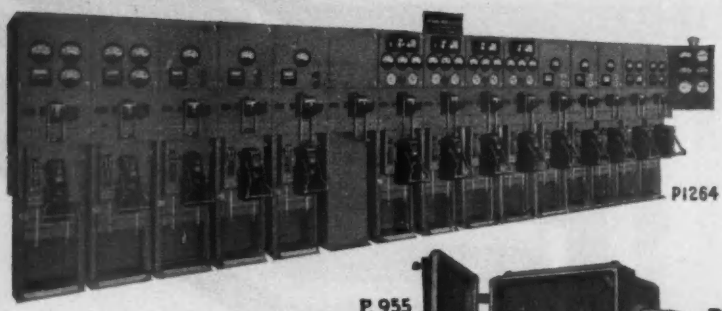
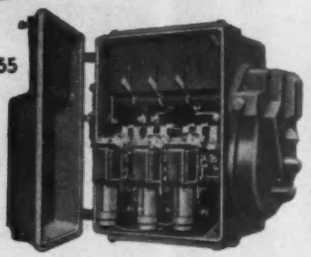


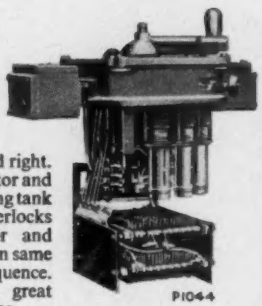
P1264

P1264 Illustrated left, Switchboard recently supplied for controlling diesel Alternator Sets and Feeders at a large Sewage Works. This Switchboard is of the duplicate busbar type and contains circuit breakers ASTA certified at 25 MVA to BS. 116 at 400 volts.



P. 955

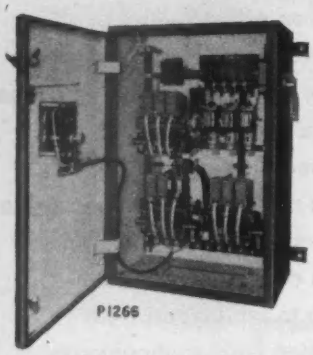
P 955 Illustration on the right is of a hand-operated air break star delta starter, fitted with interlocked isolator and solenoid type overloads with time lags. This starter can also be supplied as a direct-on starter.



P1044

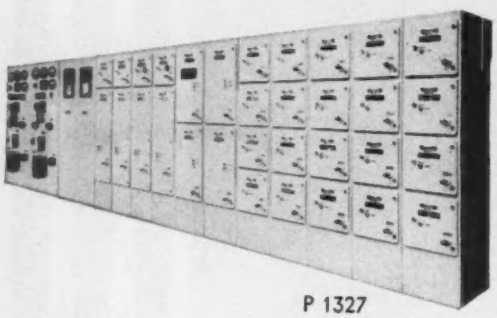
P1044 Illustrated right. Combined type stator and rotor starter showing tank removed. No interlocks required as stator and rotor contacts are on same drum in correct sequence. There is also a great saving in floor space.

CONTACTOR TYPE SWITCHGEAR & MOTOR CONTROL GEAR

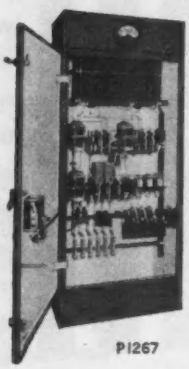


P1266

P1327 Illustrated right, multi motor contactor type Switchboard recently supplied for controlling air conditioning and refrigeration plant in the Middle East.



P 1327



P1267

P1266 Starter illustrated above is one of our CS. 30 pattern star delta starters, suitable for use up to 20 H.P. This type of starter is made in different ranges up to 250 H.P.

P1267 Starter illustrated at the left is a 50 H.P. CS. 75 type stator and rotor starter. This starter is made in different ranges up to 250 H.P. All our contactors above the CS. 15 size are bar mounted with powerful magnetic blowouts.

WE MANUFACTURE :- L.T. SWITCHGEAR 50/7,000 Amperes. E.H.T. SWITCHGEAR up to 11 kV. 250 MVA rupturing capacity. MOTOR CONTROL GEAR ¼/5000 H.P.

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First class insulation and "magic eye" thermostatic control cut running costs to the absolute minimum. Check all the Magiflow's features and see why *this* is the water heater you should recommend.

Capacity: 1 gallon.
Voltage: 200-250 V.
Loading: 2 kW at 250 V. 1.5 kW at 200 V.
Size: 17" high. 7½" wide. 8" projection.
Finish: White or cream, chromium fittings, black, easy-to-clean, toughened plastic tap.

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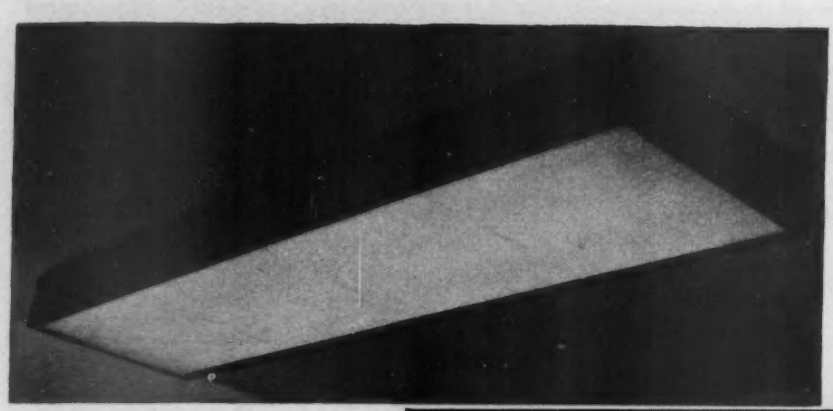

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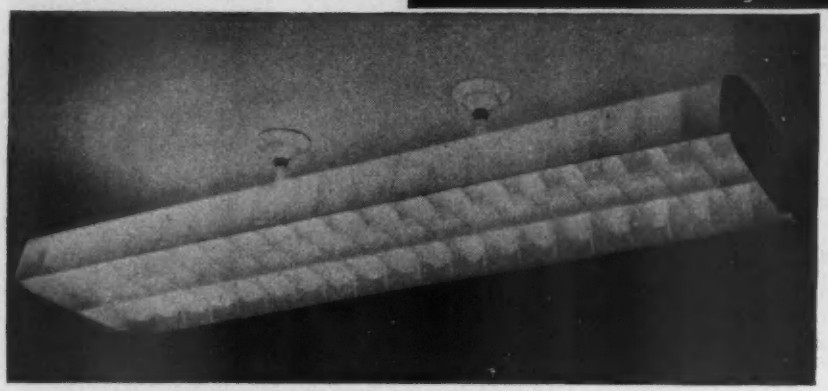
TWIN 80W. FITTING

I.E.S. CODE 1961



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For office lighting fittings which conform to the latest recommendations of the Illuminating Engineering Society and for all lighting equipment which combines utility with good design see the Harris and Sheldon range at their Birmingham and London Showrooms or write for fully descriptive literature.

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THE HARRIS AND SHELDON GROUP OF COMPANIES · SHOPFITTING · INTERIOR DECORATION · DISPLAY

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Complies with B.S. 2510: 1954

RATINGS: 15-30-60-100 AMPS

500 VOLTS A.C. or D.C.

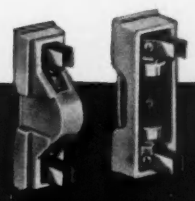
Modern buildings demand switchgear of sound technical performance and compliance with the latest relevant British Standards, and that is in harmony with the most modern surroundings. The 'Exel' range of switchgear will meet all these requirements.

Fabricated cases are of heavy gauge sheet steel with hinged covers, rust-proofed and finished grey stove enamel. Chrome plated front operating switch handles.

Removable endplates are provided at top and bottom of case with semi-pierced knockouts which, on removal, provide clearance holes for conduit.

Fuses are of the new 'Kantark-Exel' pattern which will accept semi-enclosed rewirable or H.R.C. Fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S. 3036: 1958.



H.R.C. cartridge patterns, which are interchangeable with the semi-enclosed rewirable patterns, comply with B.S.88. 1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links to B.S.88.1952, Appendix 'J' Dimensions, Form A-Offset Tags.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

Wiring space is generous. A detachable switchbar facilitates wiring.

All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.

The 'Exel' range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

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CENTRIFUGAL FANS

are by far the most commonly used for all industrial purposes. On boiler plants, both large and small, they are used practically to the exclusion of other designs, and in view of the great improvement in efficiency in this design over the last few years, they are being used to an increasing extent for mine ventilation and other ventilation applications.

The high efficiency obtained by Howden 'backward' aerofoil-bladed fans is the result of extended development testing and accumulated experience over a period of many years. Howden centrifugal fans have been developed for the highest operating efficiencies, while retaining stable operating curves, resistance to erosion and high mechanical strength.

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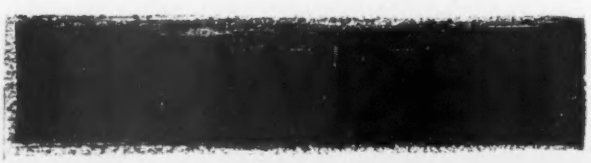

The artist's impression shows the winding of a 150 h.p. electric motor stator with pre-formed coils at Brook Motors Ltd.

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FERROSIL hot-rolled and cold-reduced electrical sheet and strip, and hot-rolled transformer sheet.

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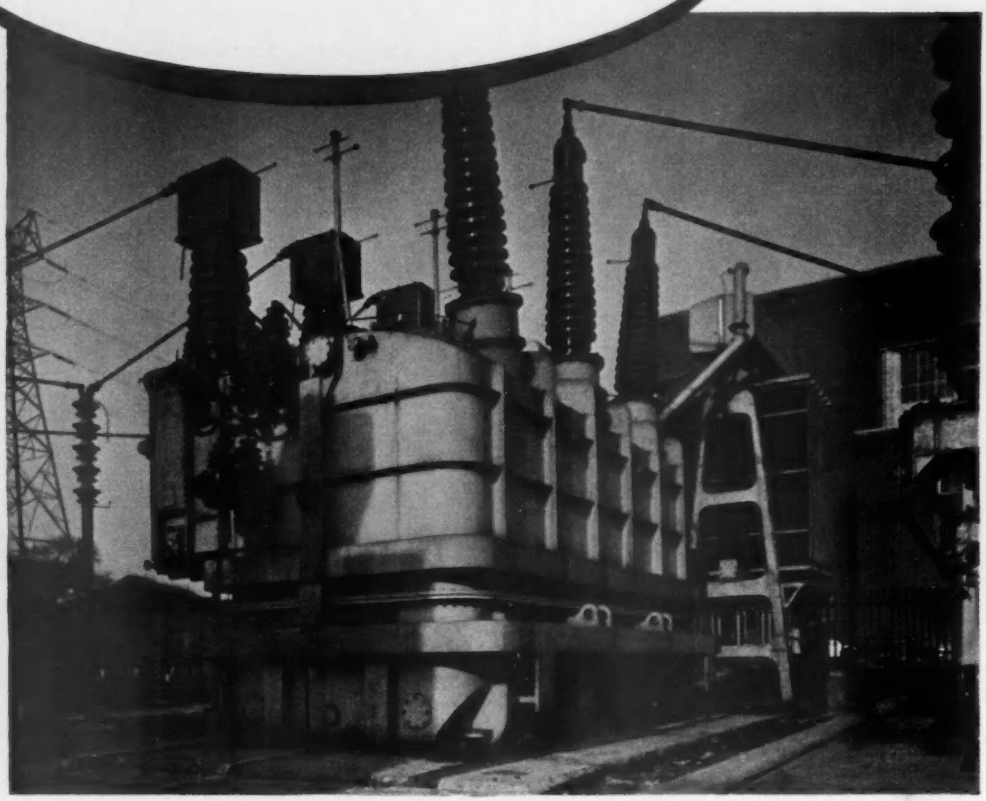

The first 180 MVA, 3 phase, 132/275 kV auto-transformer to be completed for the Central Electricity Generating Board.

Illustration shows the first of two of these transformers at the Skelton Grange Substation of the Yorkshire Division of the C.E.G.B.

The transformers, each fitted with resistor transition on-load tap changers, were manufactured at the AEI Rugby Transformer Works.

For further details write to AEI Transformer Division, Southmoor Road, Wythenshawe, Manchester 23 or your local AEI office.

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Transformer Division
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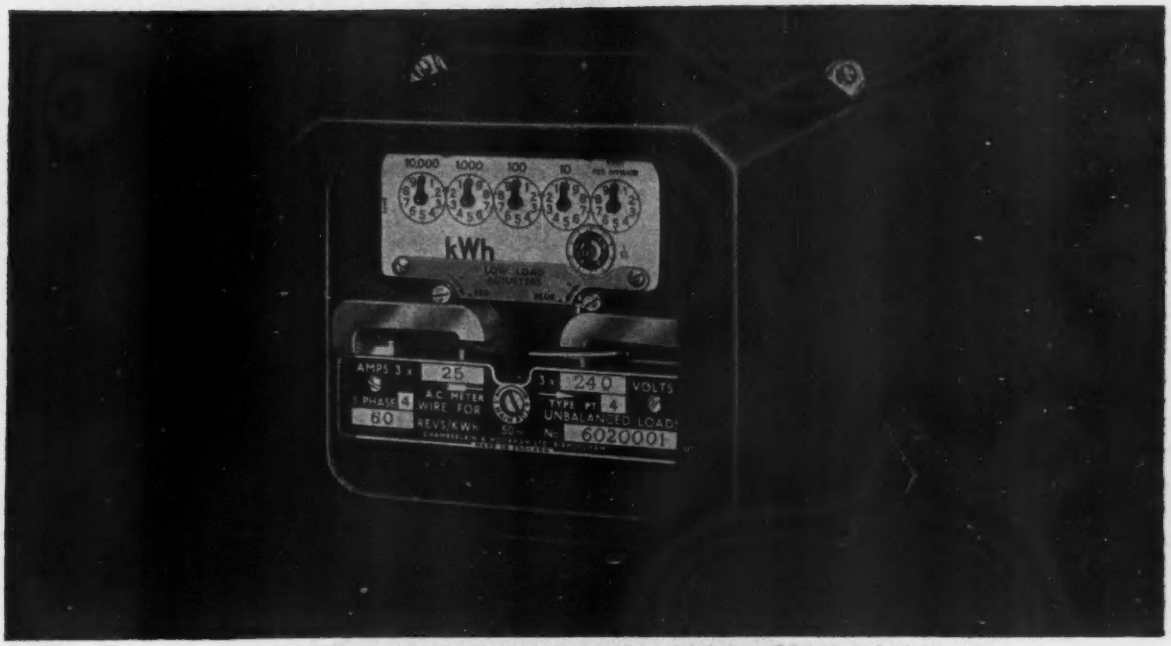
for high performance in a compact size



C. & H. P series of meters in light alloy or all-insulated cases. PT 3-phase 3-wire. PT4 3-phase 4-wire. 5, 10, 25 and 50 amperes.

POLYPHASE-SINGLE DISC TO BS37 Parts 1 & 4

There is a Chamberlain & Hookham meter for every purpose and every situation. These are the widely used P series of meters with single disc, specially designed to reduce errors due to interaction. Like all C. & H. meters they provide high performance in a compact size.

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C. & H. P type "transformeters" are of light alloy or all-insulated construction with steel transformer cases. PTU 3-phase 3-wire. PT4U 3-phase 4-wire. 100, 150, 200 and 300 amperes.

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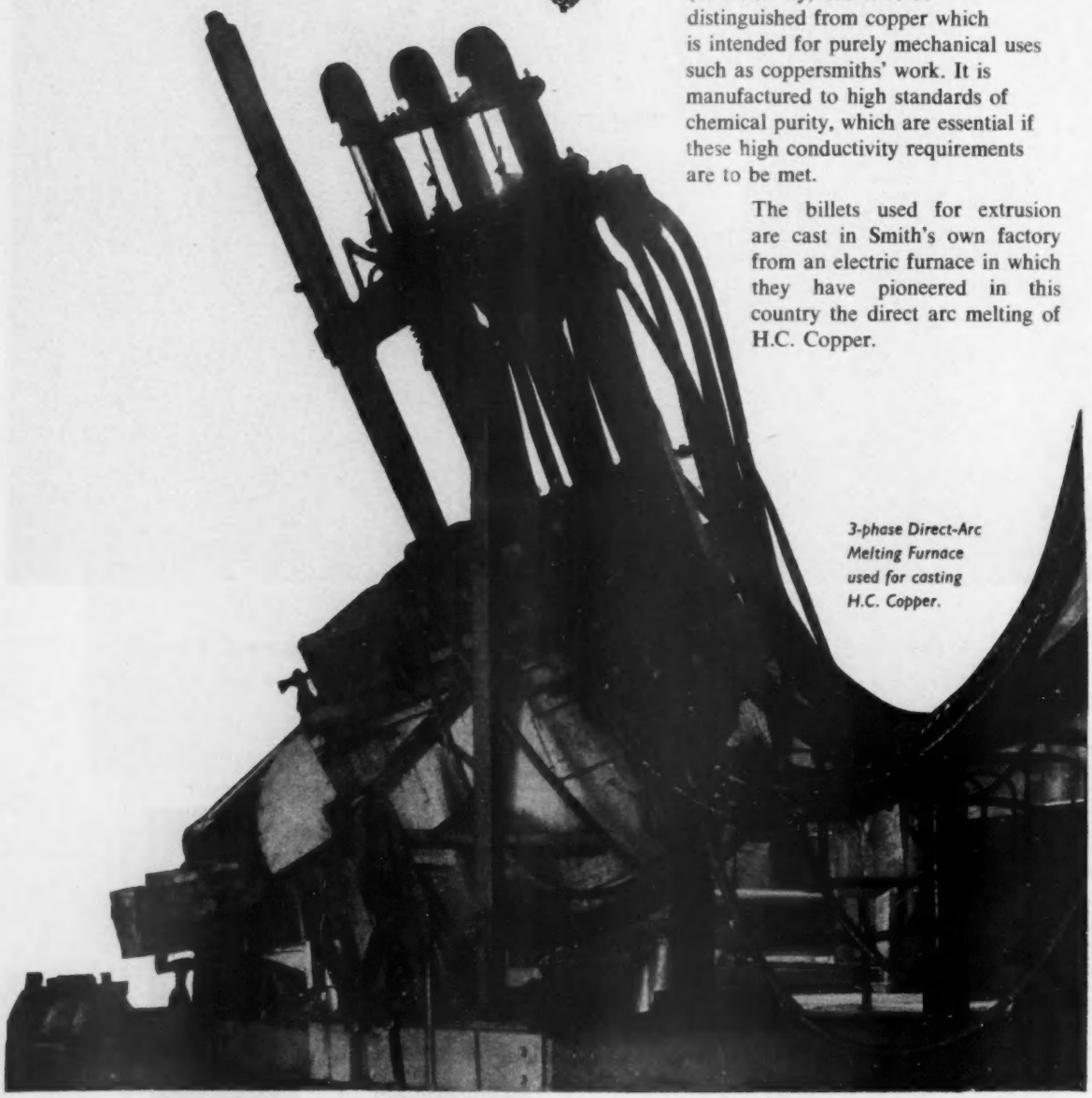
'High Conductivity Copper' is copper which complies with certain requirements of electrical conductivity (or resistivity) and is to be distinguished from copper which is intended for purely mechanical uses such as coppersmiths' work. It is manufactured to high standards of chemical purity, which are essential if these high conductivity requirements are to be met.

The billets used for extrusion are cast in Smith's own factory from an electric furnace in which they have pioneered in this country the direct arc melting of H.C. Copper.



3-phase Direct-Arc Melting Furnace used for casting H.C. Copper.

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QUITE the most successful cooker ever made —there has never been anything like it in the history of the electrical industry. The facts speak for themselves:—

Since the first model was introduced in '47, well over three quarters of a million have been sold, and more of these cookers are in use than any other cooker sold to-day.

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It continues to sell better than ever. No wonder! At £37.15.0, it's still the finest value in popular family cookers on the market.

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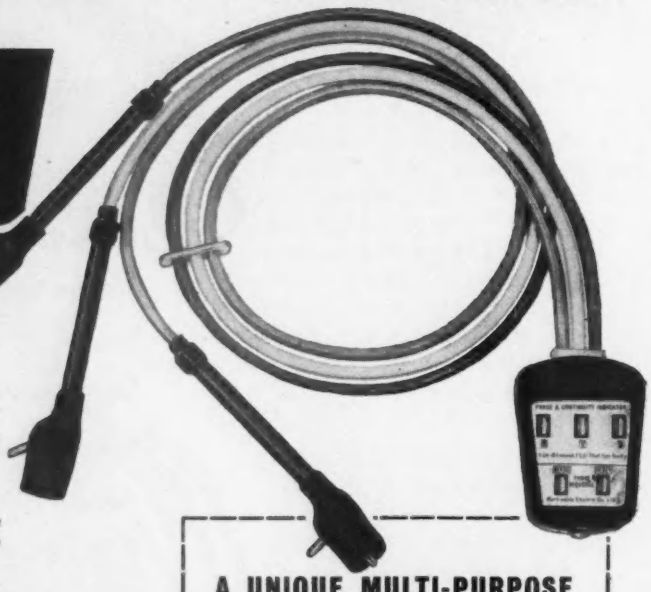
The

PHASE and CONTINUITY INDICATOR



WITH THIS INSTRUMENT AN ELECTRICIAN CAN:

1 **Prove continuity of all phases.**
2 **Ascertain faulty line if continuity is not proved.**
3 **Identify the phase colour of worn or faded leads.**
4 **Ascertain the sequence of phase rotation.**
5 **Obtain correct phase balancing.**
6 **Make correct connection of a motor where wrong rotation may cause serious damage to machinery.**

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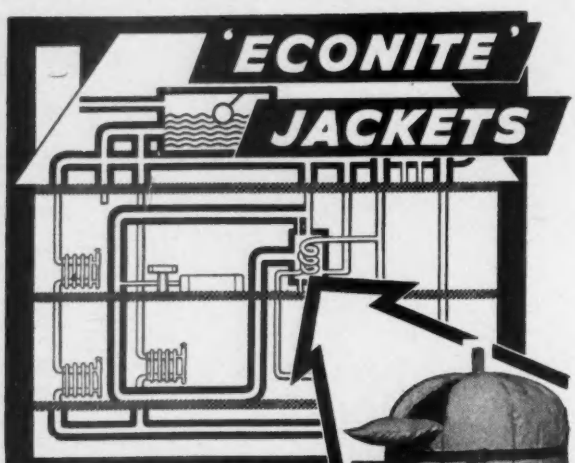

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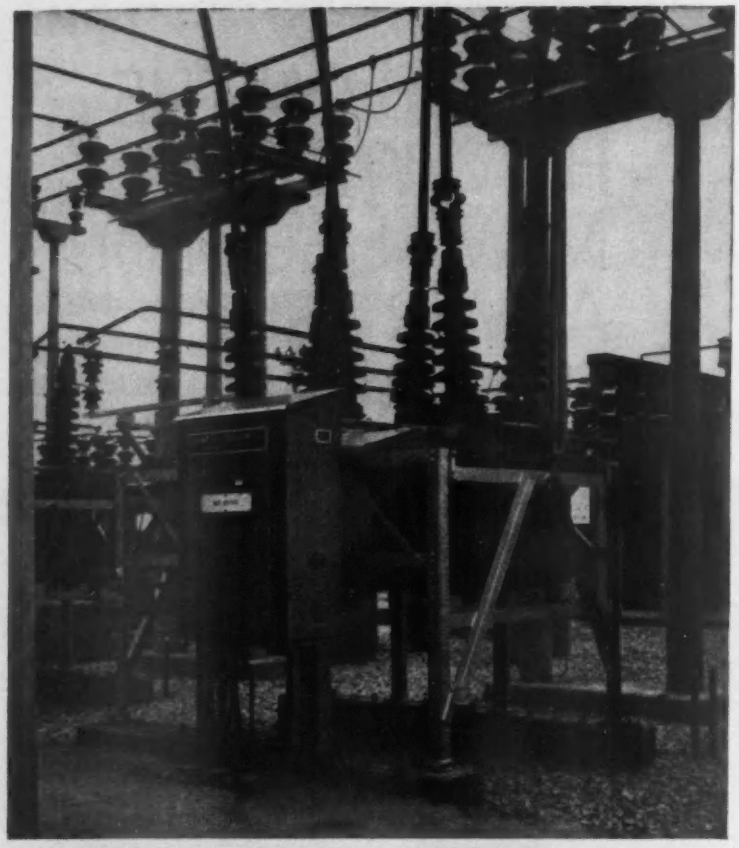

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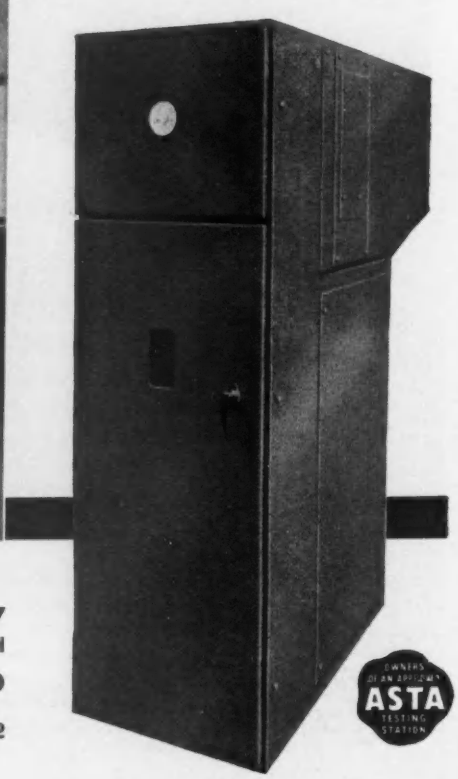

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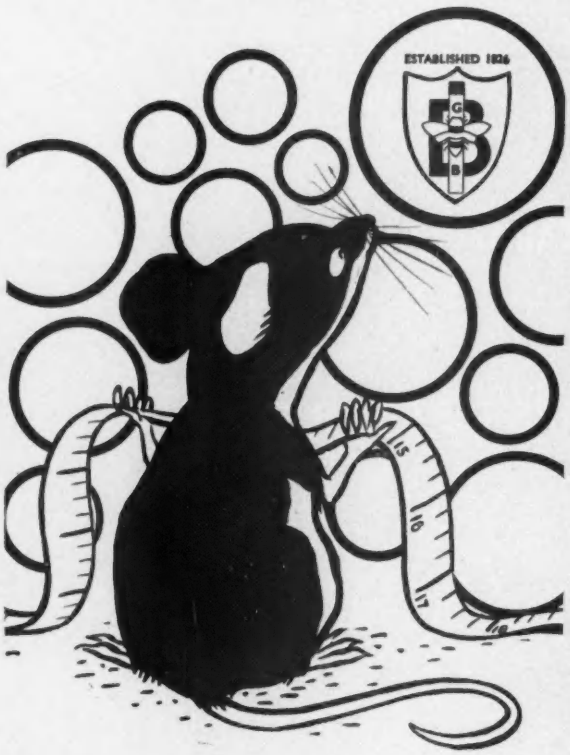

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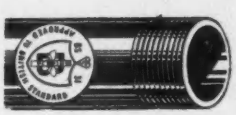

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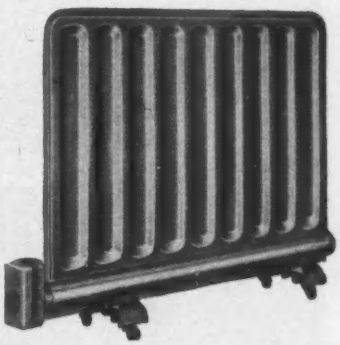

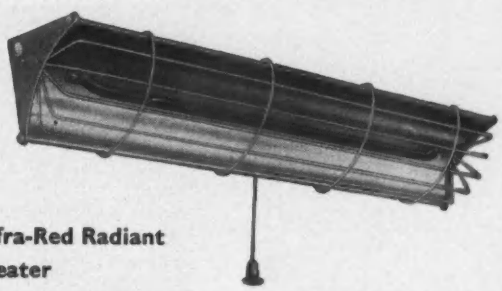

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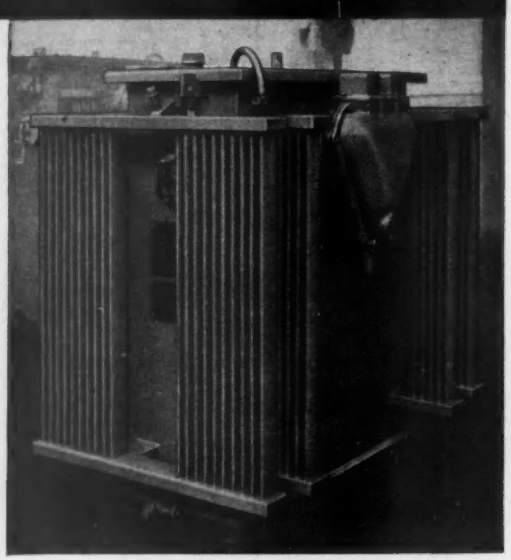

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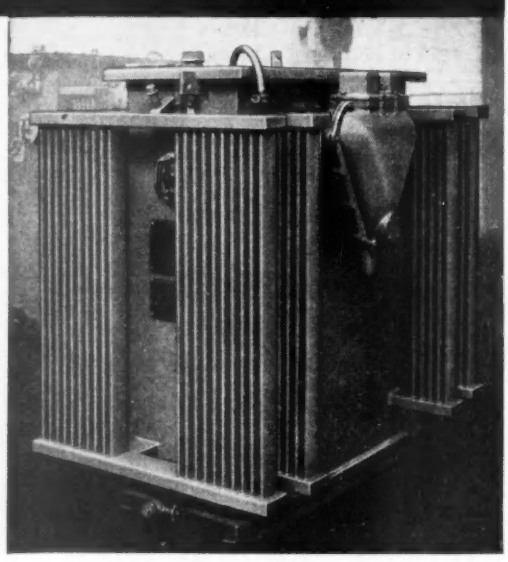

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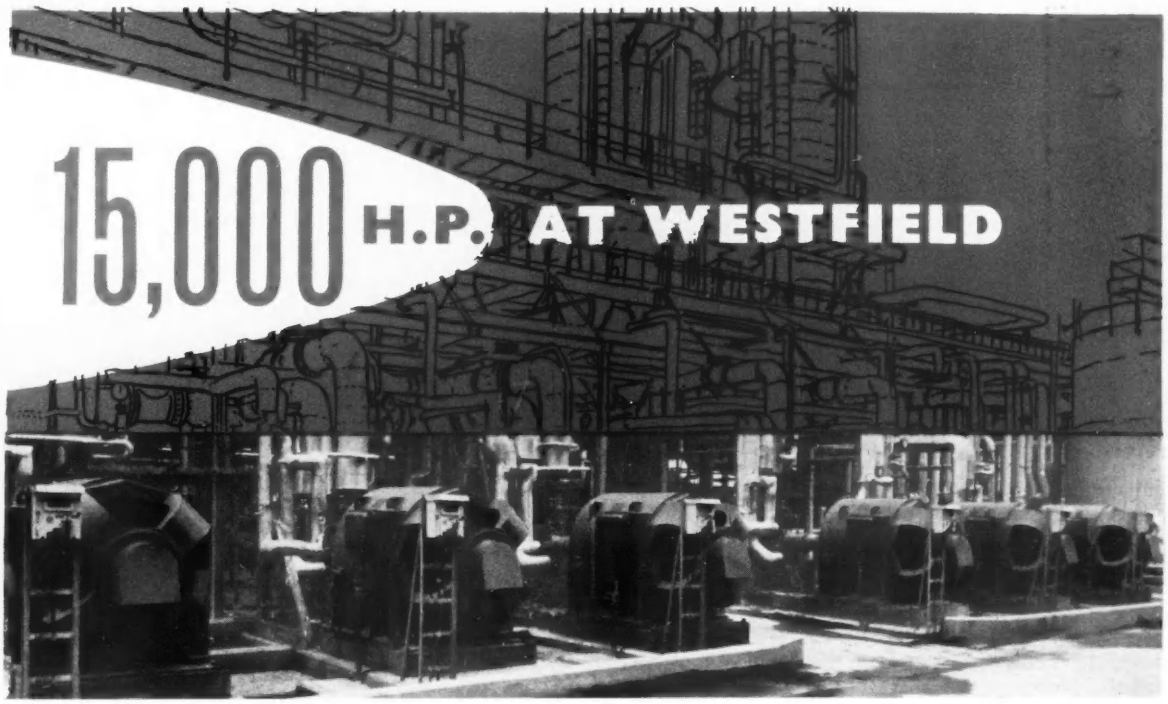

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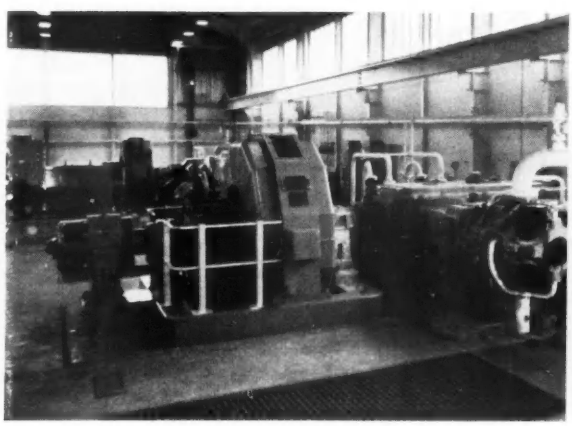

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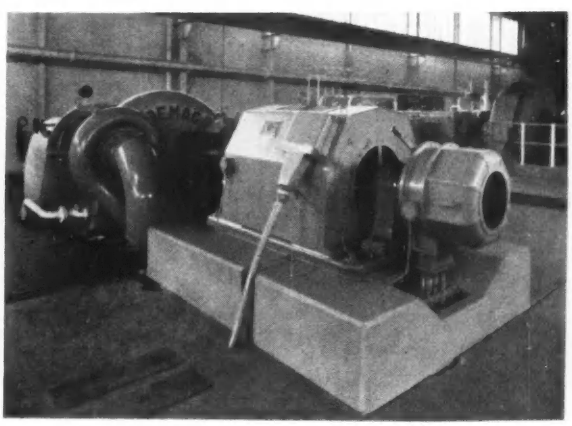

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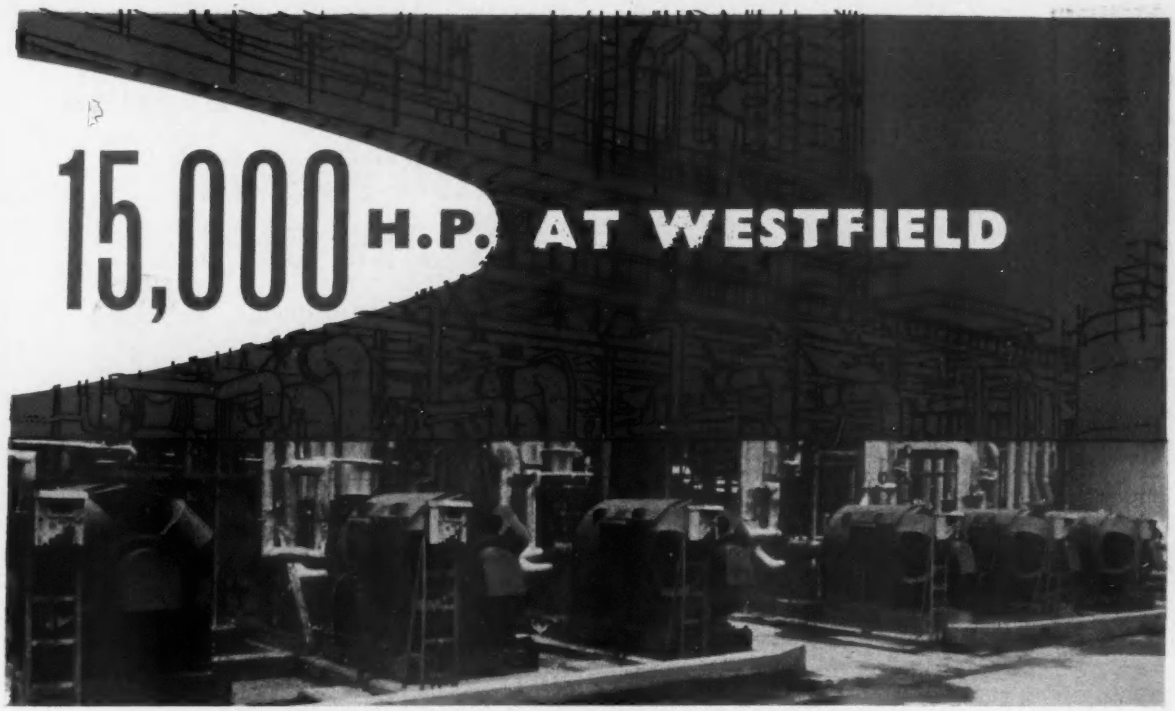

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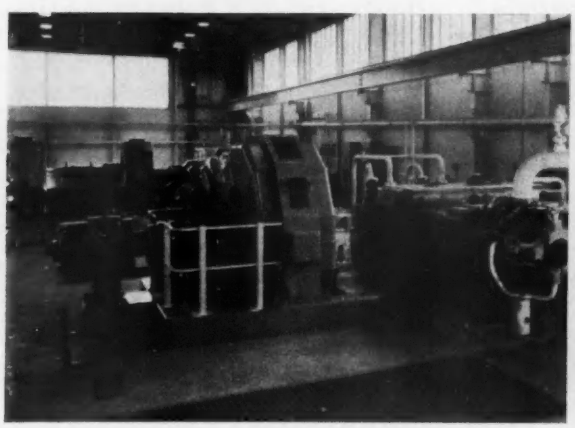

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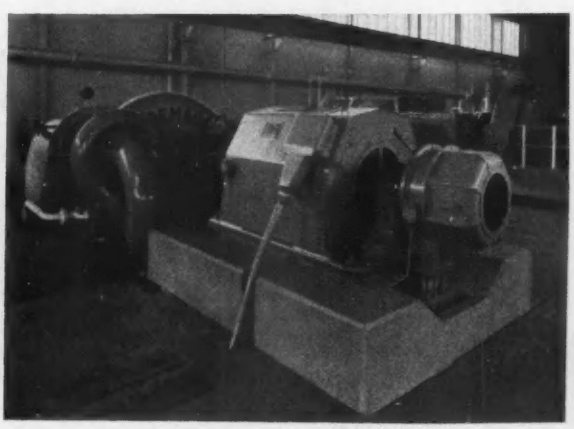

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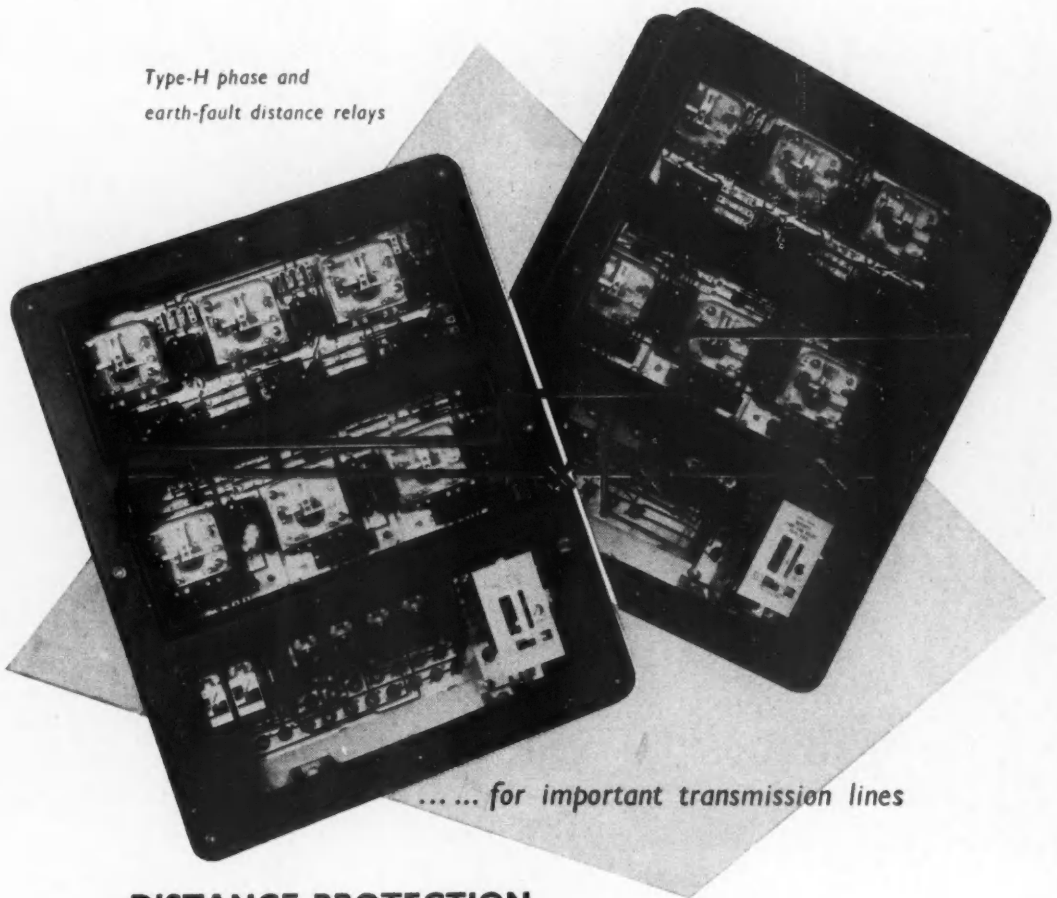

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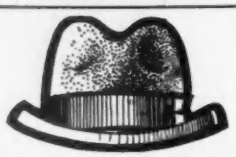
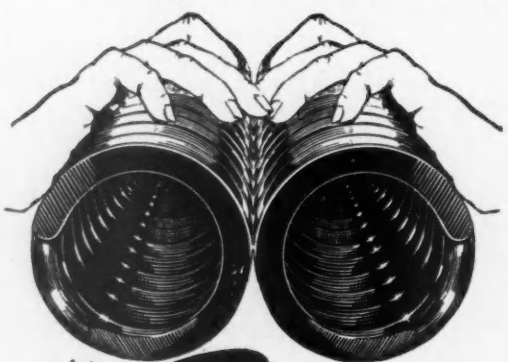


Looking in the right direction



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Phone : Rochdale 40415 'Grams : Recoil, Rochdale

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More than a million mechanical operations

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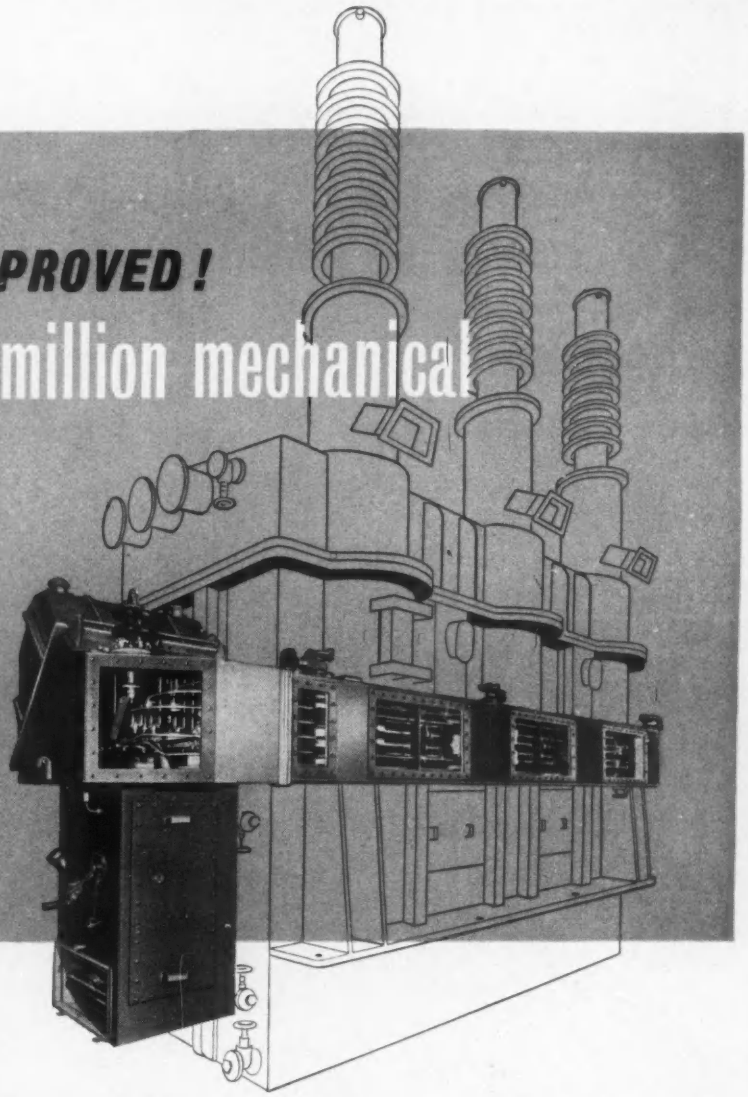

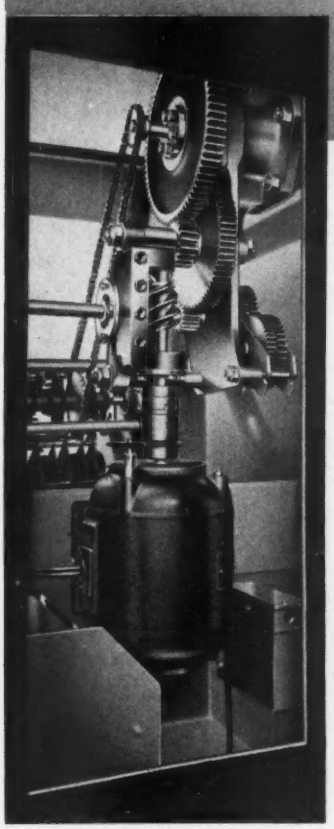

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- Suitable for 3-phase circuits from 33 kV. upwards, in four versions: 45, 70, 100 and 140 kV. r.m.s. (neutral test).
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- Separate oil compartments for selector, diverter and driving mechanism.
- Simplified control gear.
- Freedom from routine lubrication and corrosion of mechanism.
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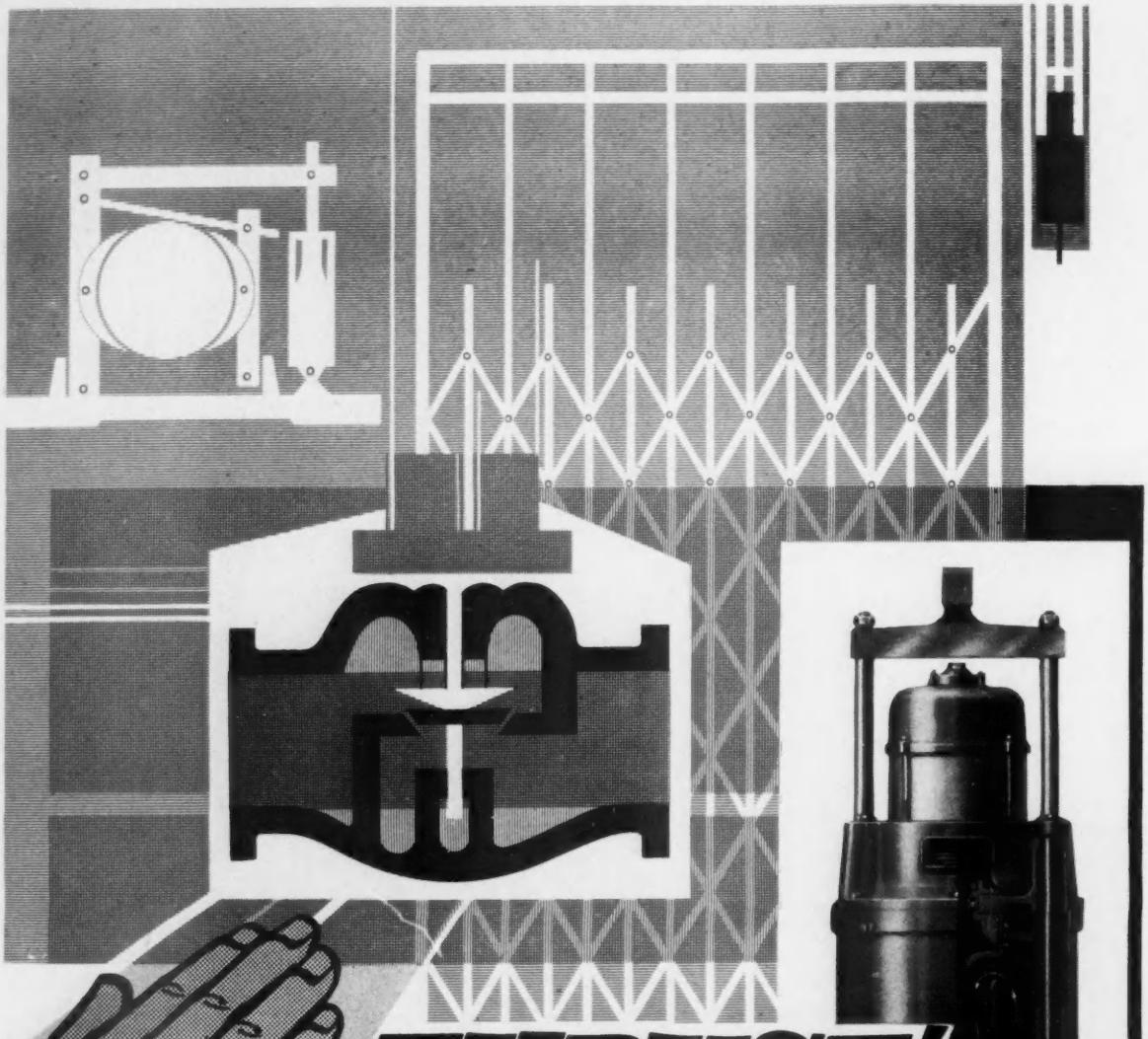

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Hand over that 'muscle' job to an AEI electro-hydraulic thrustor.

These simple units eliminate the tiring, manual work involved in operating valves, dampers, doors, clutches, small presses; repetitive jobs which cause manual fatigue, reduce efficiency, and slow down production! Easily maintained and cheap to operate. No valves, packing glands or external piping. Ideal for smooth brake operation on cranes and conveyors.

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A fractional h.p. motor operates a centrifugal oil pump, the output of which operates the thrustor piston. Ratings: From 48-lb thrust, 2-in stroke to 800-lb thrust, 12-in stroke.

Full details may be obtained from your local AEI district office, or write to:

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Associated Electrical Industries Ltd

MOTOR AND CONTROL GEAR DIVISION, RUGBY, ENGLAND

A 5600

under 3 minutes to wire and clip-in a 3-gang switch . . .

'MUTAC CLIPPER'

G.E.C. Installation Equipment Group have a *new approach* to designing switches. This makes 'Mutac Clipper' switches unrivalled for ease and speed of installation . . . ensures that these precision-made, electronically-tested switches give a guaranteed long-life performance . . . takes the clicking out of switching. G.E.C.'s *new approach* enables you to put up to 3 'Mutac Clipper' switch units into a standard BS 1299 or plaster depth box. There's a choice of 44 different switch plates—in moulded plastic or metal—and 11 interchangeable switch units fit into just 3 different sized grids and boxes.

5 amp 1 way S.P.
15 amp 1 way S.P.
5 amp 1 way D.P.
5 amp 2 way S.P.
5 amp 2 way & off
5 amp intermediate
5 amp 1 way secret
5 amp 2 way secret
Bell Push
Neon Indicator
Blanking Unit

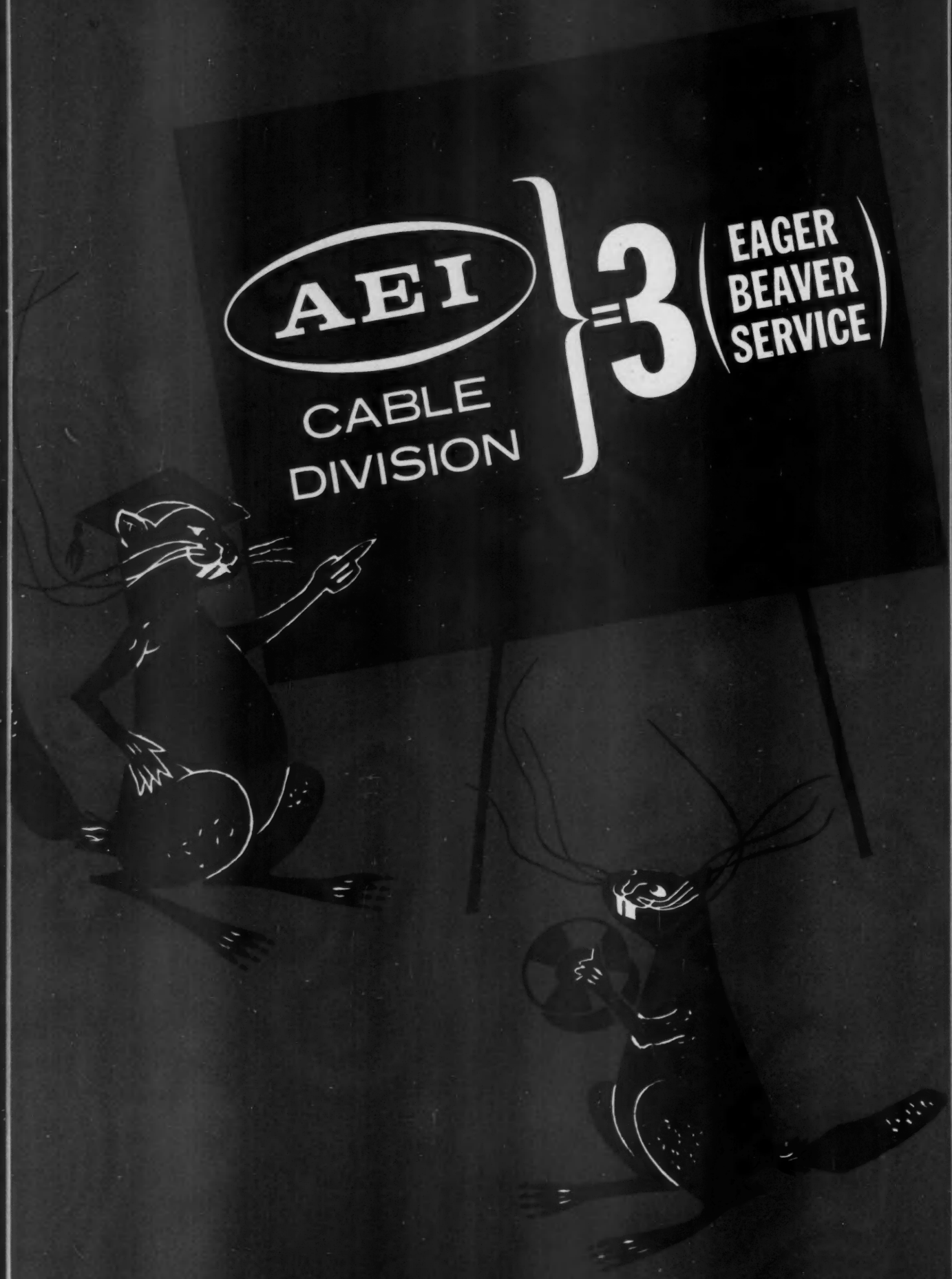
'Mutac Clipper' switches cost no more than ordinary switches to buy and far less to install—that's a result of G.E.C.'s *new approach.* Complete interchangeability of 'Mutac Clipper' enables you to standardise right through a job.

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

IMMEDIATE DELIVERY

of all 'Mutac Clipper' switches from wholesalers throughout the country. If you would like more detailed information ask your wholesaler for 'Mutac Clipper' literature.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This is one of the simplest and most reassuring equations in the Cable Industry. It means that, for **wiring cables and flexible cords,** the AEI Cable Division can offer you three times the Eager Beaver Service which you enjoyed of yore. Their combined resources can give you three times the willingness, three times the resourcefulness and three times the knowledge. It's good to know, in the hazards of modern business life, that you can rely on something that can really stand on its own legs. And the AEI Eager Beaver Proposition can certainly do that. All six of them!

AEI **CABLE DIVISION**

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Cable Sales Department

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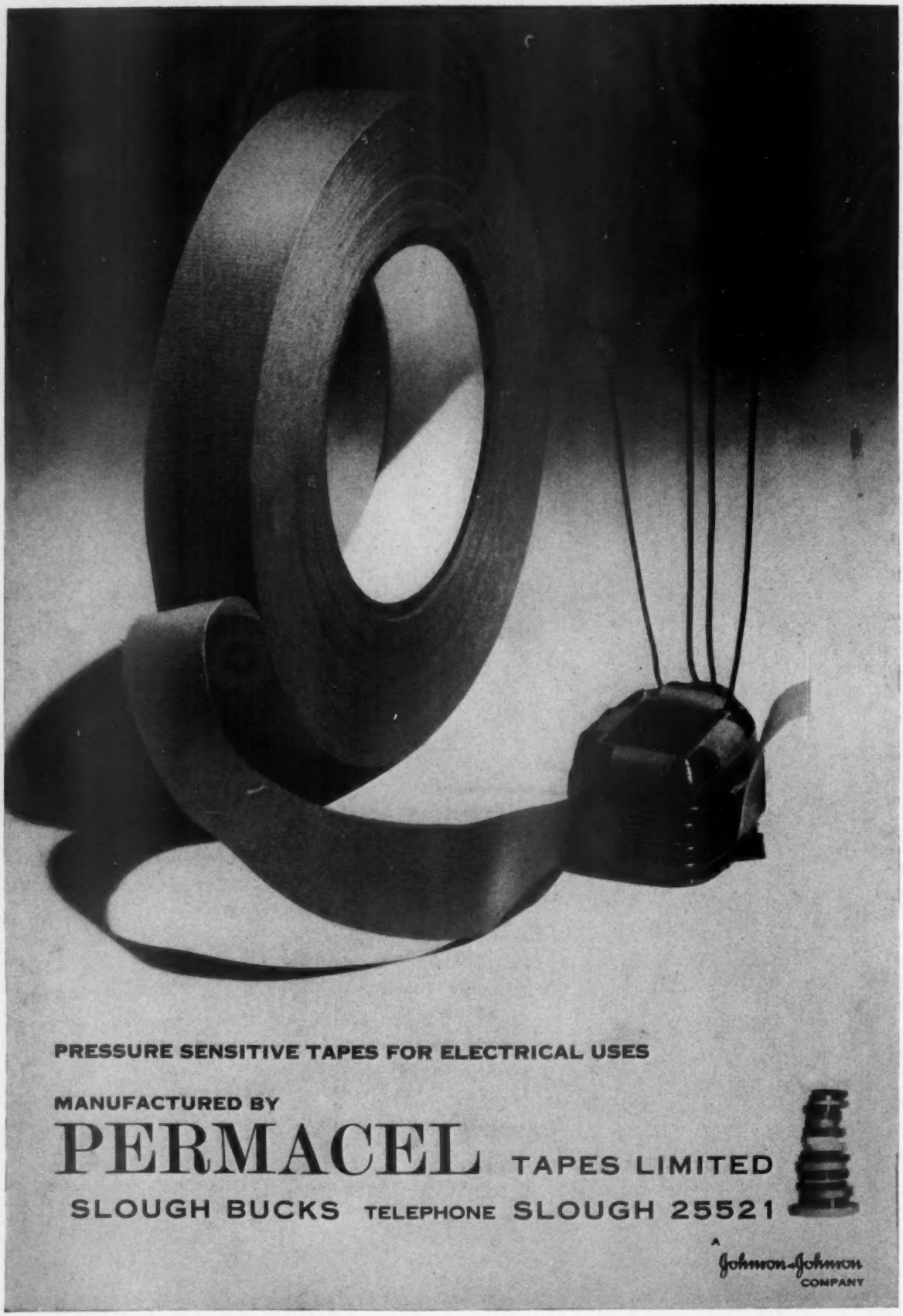
PRESSURE SENSITIVE TAPES FOR ELECTRICAL USES
MANUFACTURED BY
PERMACEL TAPES LIMITED
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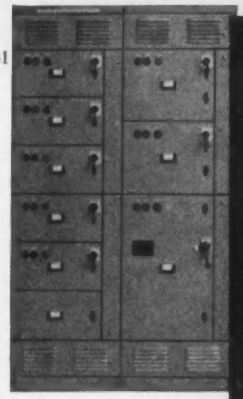
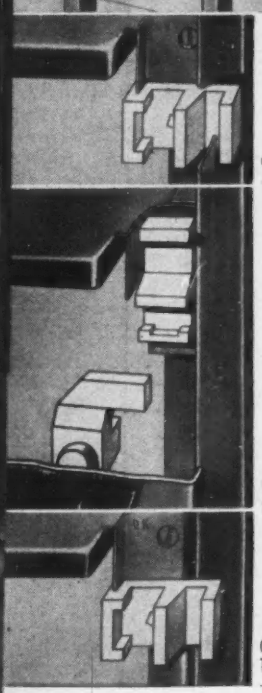
A Johnson & Johnson COMPANY



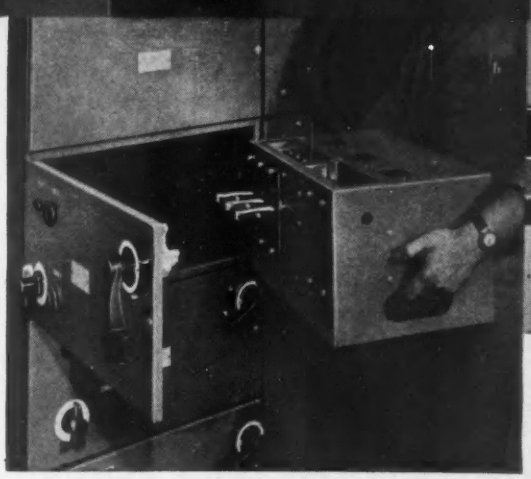
ALL THESE



ON – locked in – safe

OFF – tray free

ON – locked out Tray unplugged – safe



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EXTRA SAFETY
Plugs carry 100% overloads within B.S. temperature limits

MAXIMUM FLEXIBILITY
All starter units interchangeable

SUCH COMPACTNESS
18″ deep cubicles save space

QUICK DELIVERY
Within 12 to 16 weeks of order

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357

'Diamond H' Controls for domestic applications

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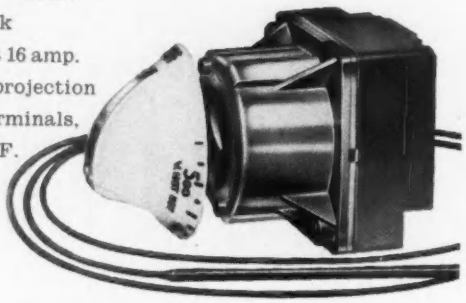
A single pole, single circuit hydraulic slow break instrument rated at 16 amp. 250 v. A.C. Shallow projection easy wiring, rear terminals, positive indexed OFF.



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60 Series (shallow lens) and 80A-82A Series snap-in fixing neon indicators suitable for circular or square panel mounting holes, available for 115, 250 or 415 volt supplies.

BOLTON'S H.C. COPPER
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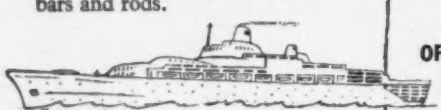
For the rapidly expanding world of marine electrics Bolton's manufacture commutator bars and segments in h.c. copper and "combarloy" (a silver-bearing copper); extruded and drawn sections; annealed strip for alternator windings ; busbars; bars and rods.

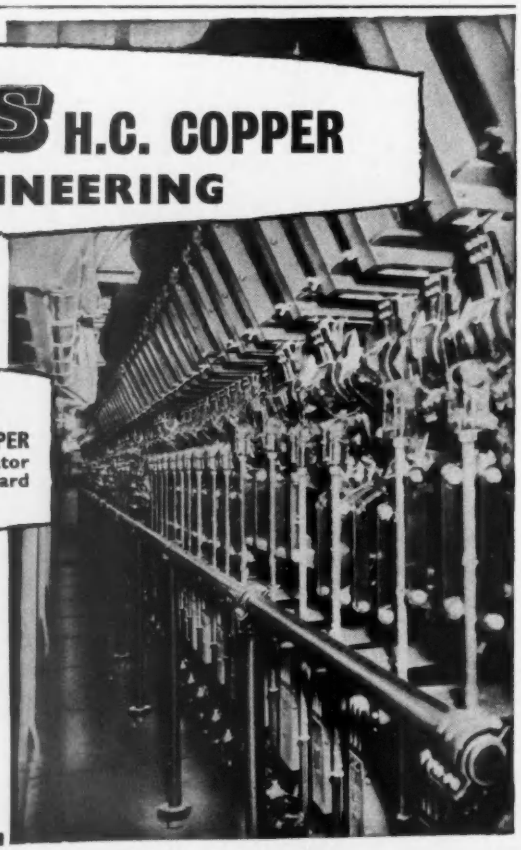


21 TONS
OF BOLTON'S H.C. COPPER
used on main generator and feeder switchboard in s.s. "Oriana"

s.s. "Oriana", 42,000 tons gross, the latest addition to the P & O—Orient Lines fleet built by Vickers-Armstrongs (Shipbuilders) Ltd.

The photograph on the right shows the rear view of the feeder section of the main switchboard, 69' in length, manufactured by **Whipp & Bourne Ltd.** For this section and also the generator section, Bolton's supplied 21 tons of h.c. copper.

Photograph by kind permission of Vickers-Armstrongs (Shipbuilders) Ltd.



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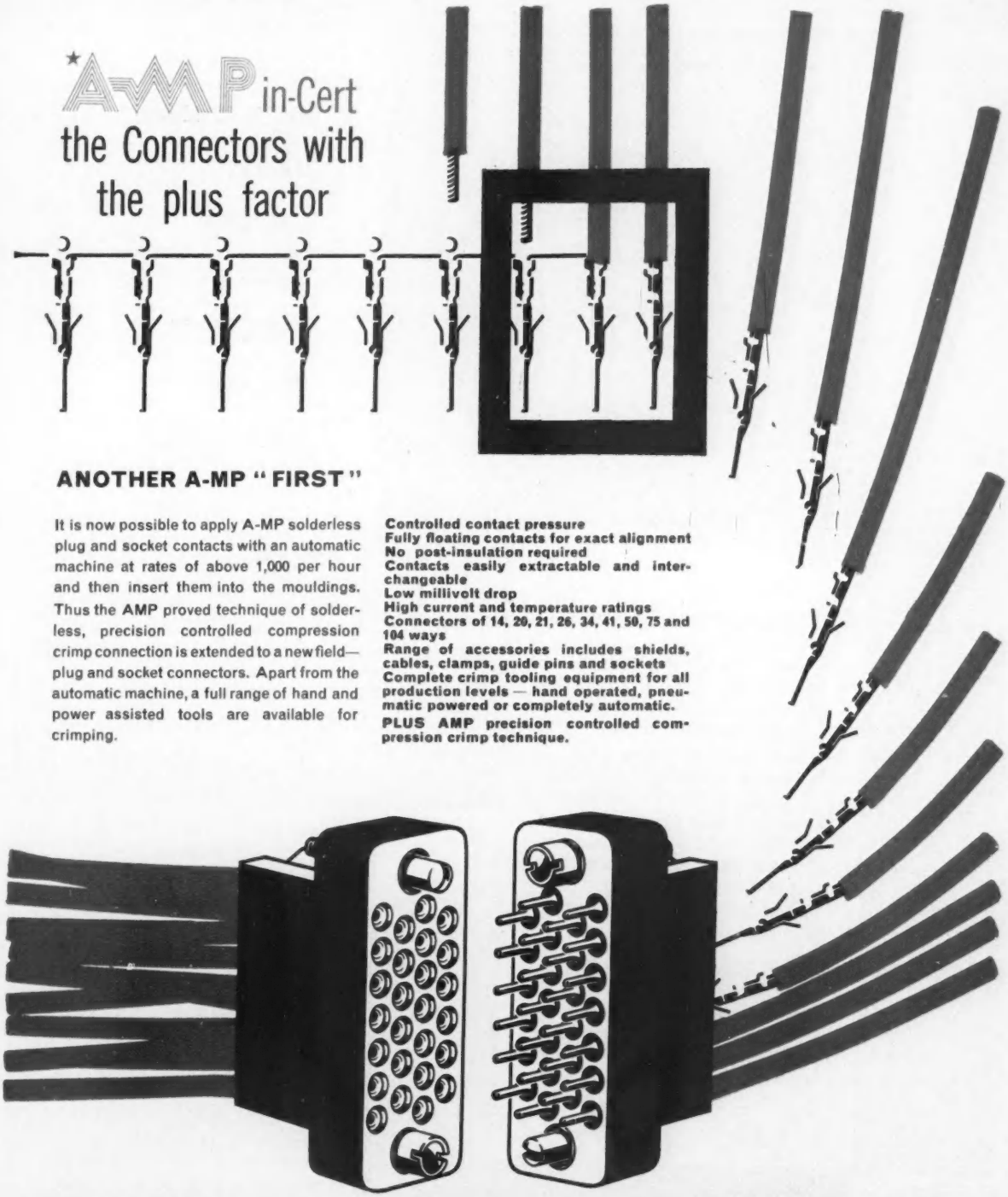
the Connectors with the plus factor



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It is now possible to apply A-MP solderless plug and socket contacts with an automatic machine at rates of above 1,000 per hour and then insert them into the mouldings. Thus the AMP proved technique of solderless, precision controlled compression crimp connection is extended to a new field—plug and socket connectors. Apart from the automatic machine, a full range of hand and power assisted tools are available for crimping.

Controlled contact pressure
Fully floating contacts for exact alignment
No post-insulation required
Contacts easily extractable and interchangeable
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High current and temperature ratings
Connectors of 14, 20, 21, 26, 34, 41, 50, 75 and 104 ways
Range of accessories includes shields, cables, clamps, guide pins and sockets
Complete crimp tooling equipment for all production levels — hand operated, pneumatic powered or completely automatic.
PLUS AMP precision controlled compression crimp technique.

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AP187

S.W.S. Type UEI.

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Over the past years S.W.S. type UEI metal-enclosed switchgear has earned a world wide reputation for reliability in service. Since its introduction this 33kV vertically isolated, single and duplicate busbar package unit has proved all claims made for it.

Simplification of preparatory site work and complete assembly at the works make for easy and fast erection ; the package unit illustrated bottom right was erected in 21 days.

Safety in service in any climatic conditions is ensured by the porcelain insulation and the design allows 'in situ' inspection in all weathers.
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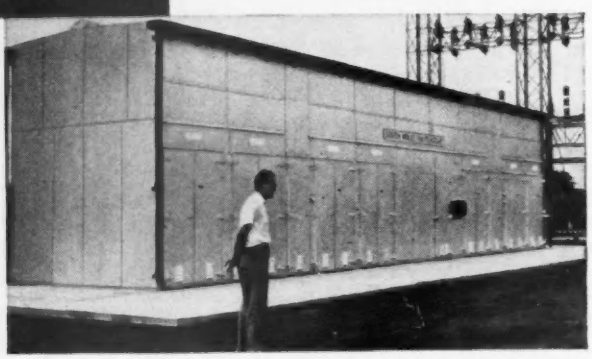

33kV Package Switchgear Unit in South America.

33kV Package Switchgear Unit in South Africa.

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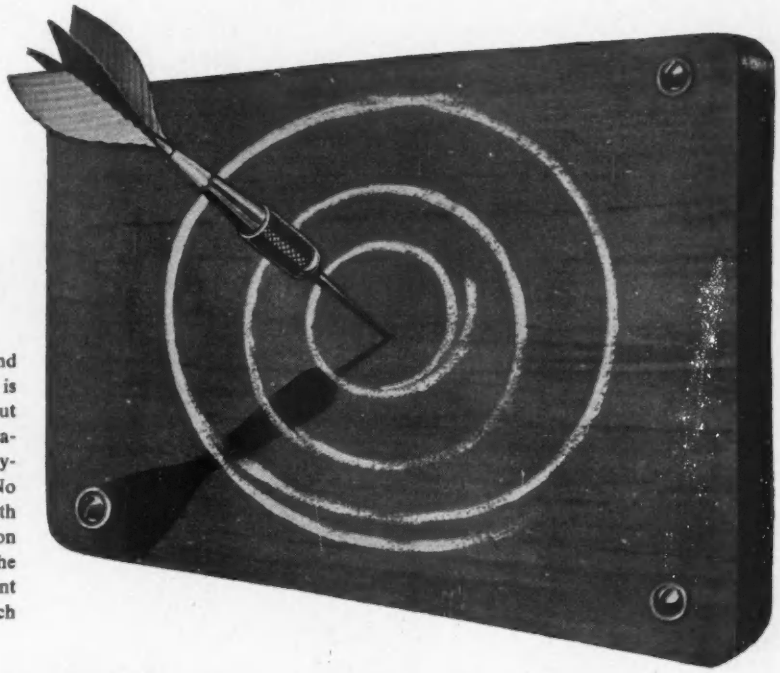
RANSFORMERS • CONTROL BOARDS

SW 30

Wootton meter boards score every time!



Bound to ... if they're Wootton-made ... and Wootton-tested! Only the stoutest plywood is good enough for Wootton. Every piece is put to the test. For reliability, toughness, durability. Wootton meter boards stand up to anything. Even in the most extreme climates. No contraction or expansion or warping with Wootton! Oh, and there's more to Wootton than just meter boards. They're right on the target with wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

WOOTTON–the meter board people

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"HANDYWAY" "GRIPWAY" HANDLAMPS

Ideal for home and industry

"LIGHTERWAY" "SILVERWAY" FITTINGS

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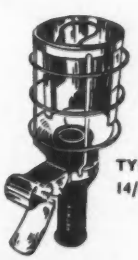
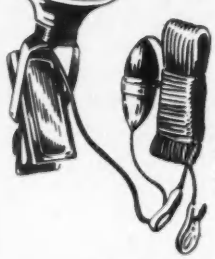
8/11 each



TYPE 4785/AW
14/8 each

TYPE 447/AW 7/8 each

TYPE 904/AW
18/6 each



TYPE 288/AW
25/- each

TYPE 917/PH
PORCELAIN TOP
60 WATT
12/4 each

TYPE 917/5647
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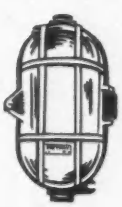
16/8 each



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TRANSLUCENT DIFFUSER
40 WATT 10/6 each

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CAST TOP
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ALL THE ABOVE ALSO AVAILABLE IN 100 WATT

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Looks like another job for Dad —and the magic stuff he uses for putting funnels back on. Magic? Well not really, it's *solder.* It's *Fry's* solder—a subtle alloy of pure metals that make child's play of soldering and jointing. Made in lots of grades too. From the sort you use for tin funnels to the sort they solder stainless steel with, or zinc, or copper, or electrical joints or—all kinds of things.

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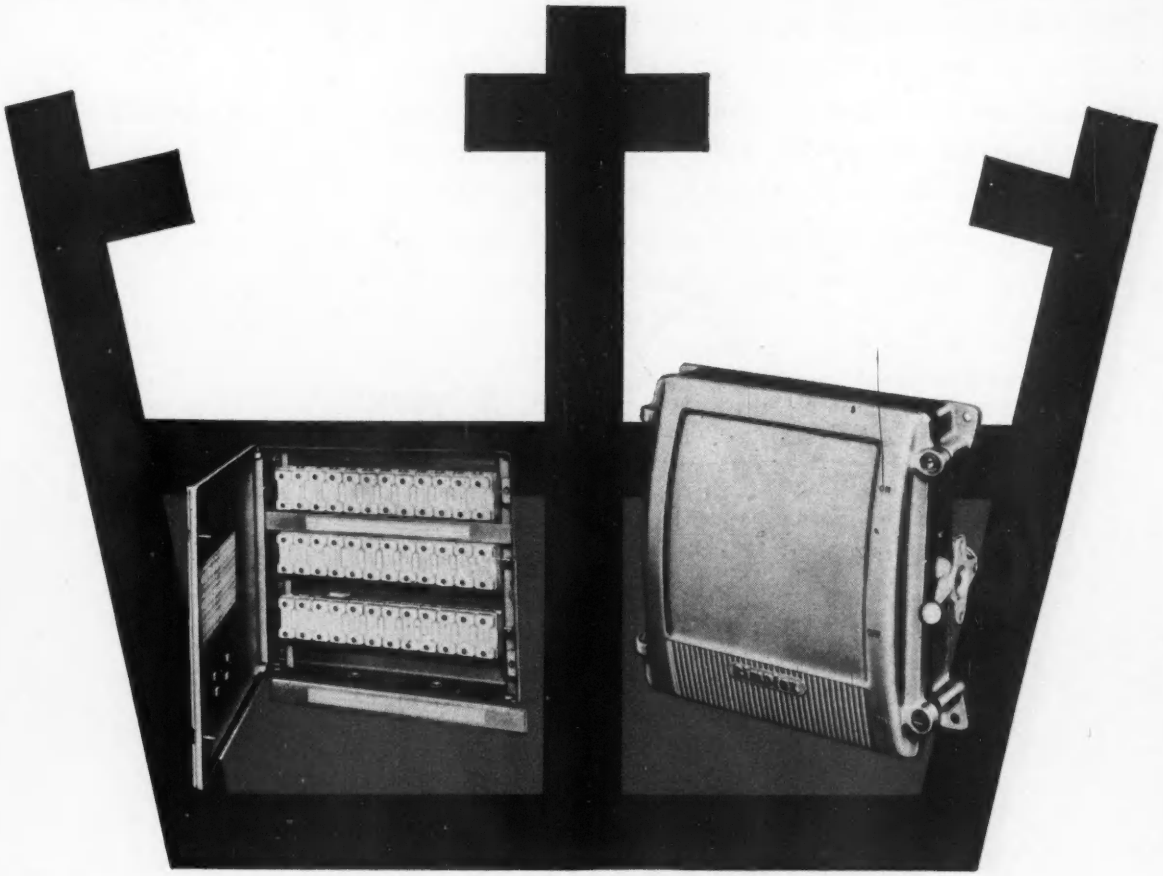

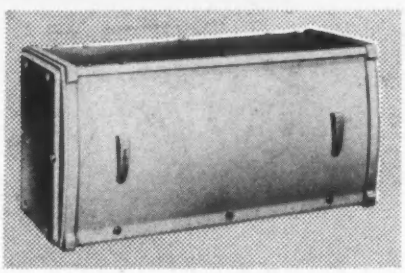

SIMPLEX REGENT SWITCHGEAR PART OF THE COMPREHENSIVE MEDIUM VOLTAGE SIMPLEX RANGE OF SWITCHGEAR

The sturdy, stylish Regent range of switches, switchfuses, and changeover switches are conventionally constructed to meet a very wide range of requirements. The casings are weatherproof and dust protected as defined in BS 861 and 2510. All units are HRC or rewireable — fuses completely interchangeable.
Sealing chambers and glands for Regent switchfuses are made for any type and size of normally used cable, either straight or reverse entry without drilling.
The entire Simplex Regent range is suitable for lighting, heating and power loads without de-rating.
Switches, switchfuses, changeover switches 15, 30, 60 and 100 amp. 500 volt.
Busbar chambers 350, 550, 800 amp. 600 volt.
Distribution fuseboards 15, 30 amp. 500 volt.

Simplex

ELECTRICAL DIVISION

SIMPLEX ELECTRIC COMPANY LIMITED
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Branches throughout Great Britain and Agents throughout the World

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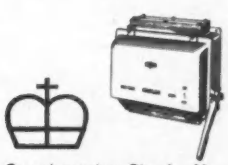
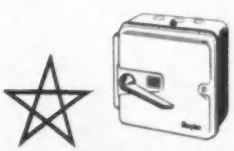
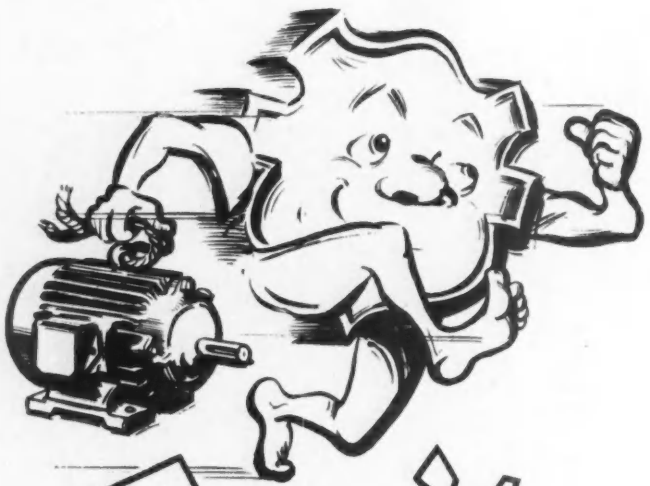


Complementary Simplex Monarch range. Heavy duty fuse switches, suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt.



Complementary Simplex Star range. Economically priced, front operated switchfuses in 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.

D



Can't stop!

—says Lanky Dynamo

Can't stop—I'm off to deliver a new L.D.C. motor—the "CRYPTO-D"—much more powerful—don't know how they manage it—and still B.S.2613—'course L.D.C. always have been quality—this "CRYPTO-D" 's a winner—no time for details now—must be off—drop 'em a line or get 'em on the blower—nice people—very helpful.

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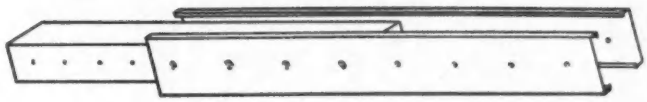
rigidity

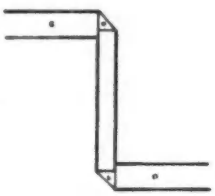
flexibility

adaptability

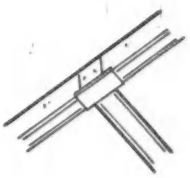
CRYSELCO TRUNKING is simple to assemble and very quick erection is possible by using the special suspensions. Two men working under normal conditions can erect several hundred feet of trunking in a day. Other electrical services can be carried in the wiring ducts on each side of the centre section. Additional fittings can be erected in a matter of minutes and the existing ones can be repositioned merely by loosening two screws.



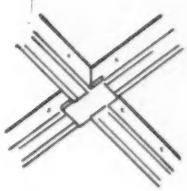
The overlap method of construction ensures fixings up to 18 ft centres



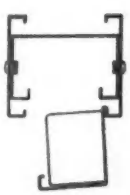
90° riser



T joint



crossover



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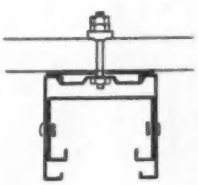

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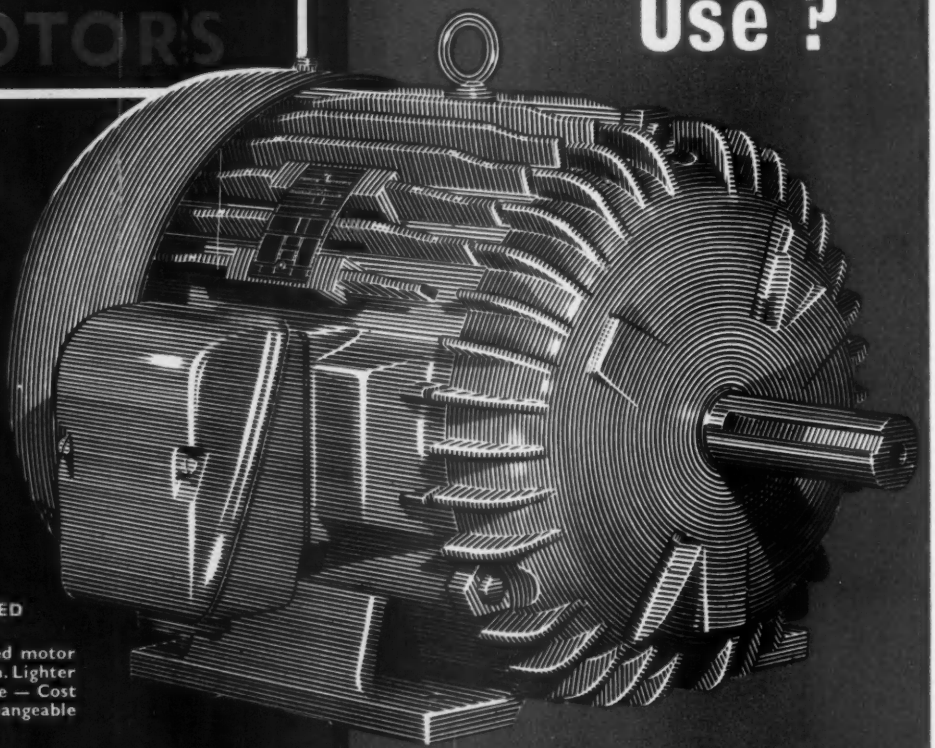

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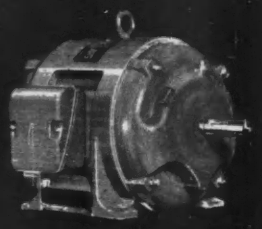

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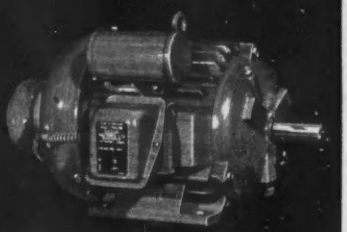

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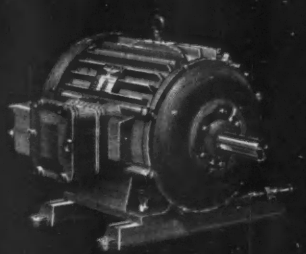

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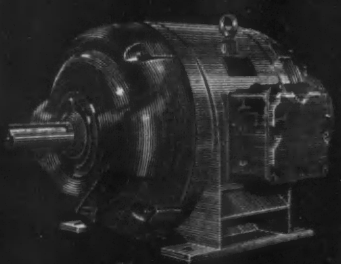

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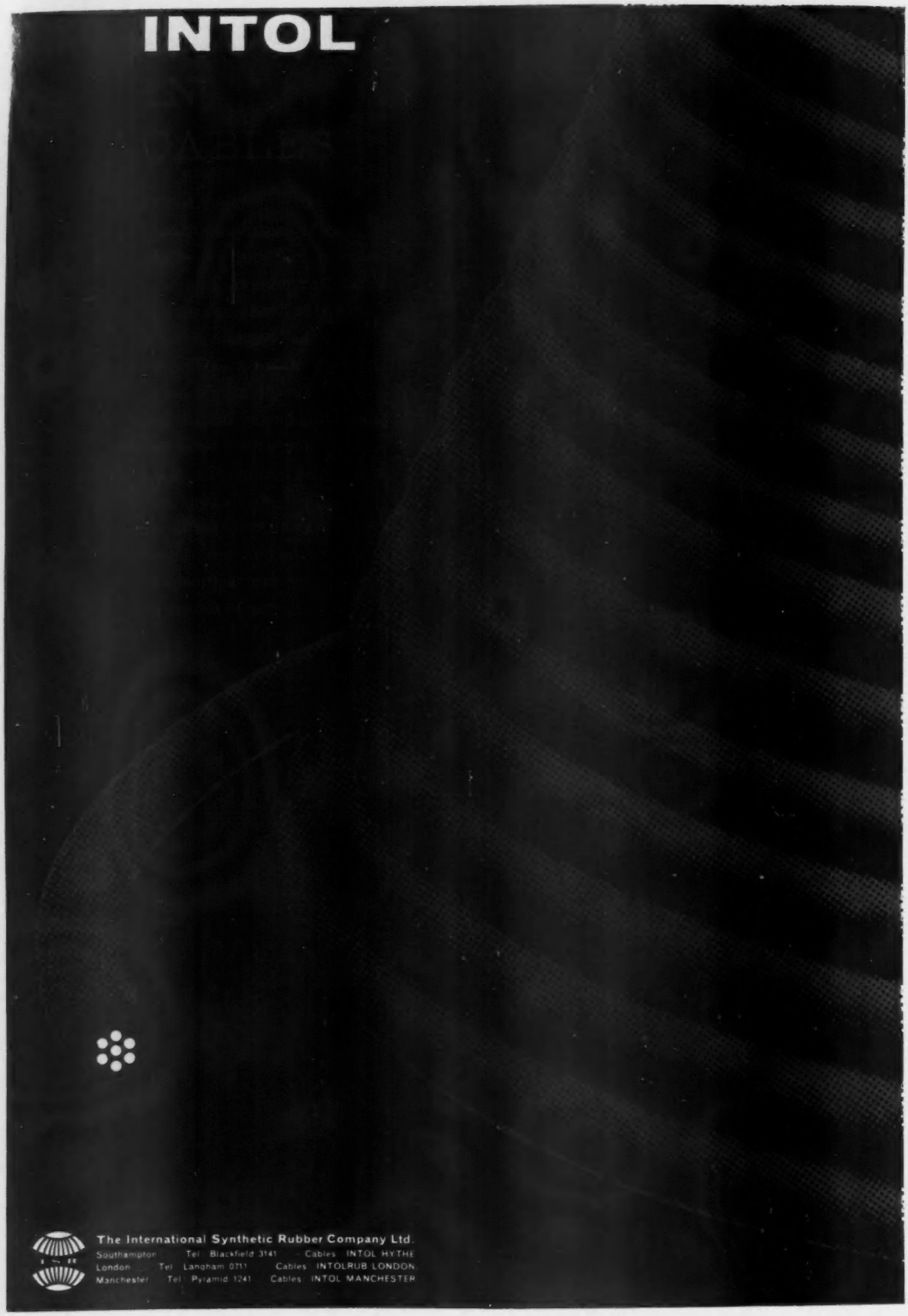

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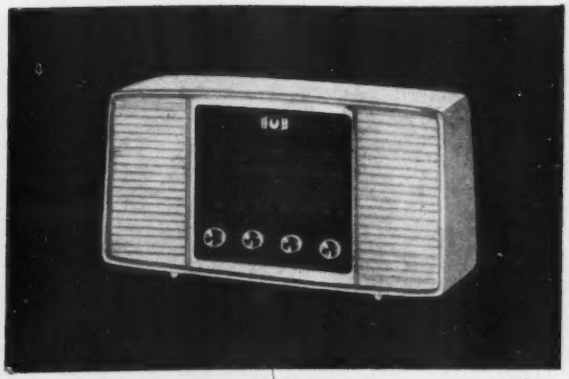

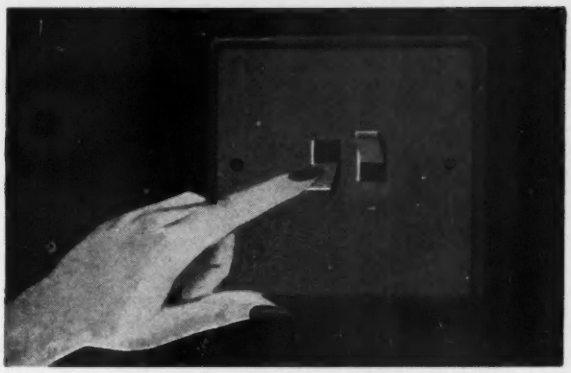

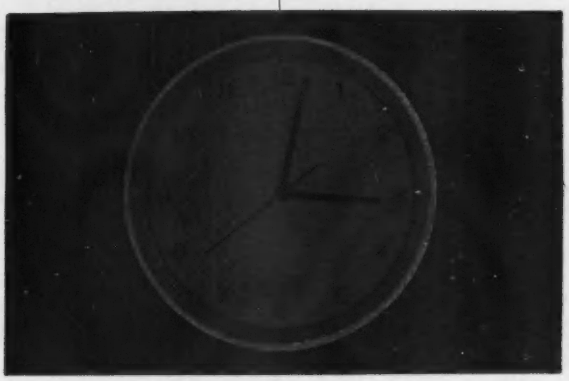

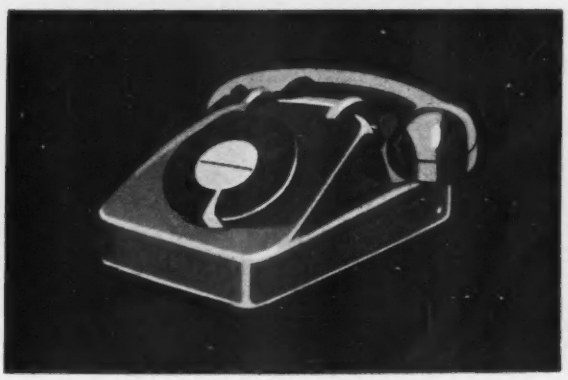

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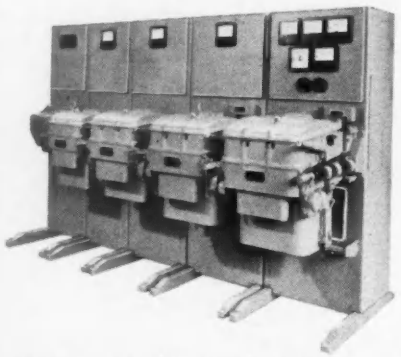

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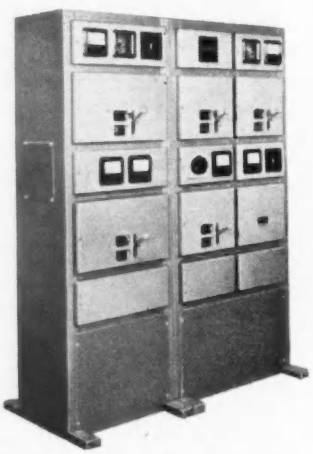

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for complete reliability

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THURSDAY 21 SEPTEMBER, 1961
Registered as a Newspaper Volume 140 No. 12

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Bruit provenant de l'éclairage fluorescent 403

Le bruit qui est produit par l'appareillage de commande des lampes fluorescentes est dû en partie à la magnétostriction. Ce bruit peut être réduit grâce à une étude soignée et à l'usage de circuits magnétiques fonctionnant à des densités de flux moins élevées. Toutefois cette technique se complique par la nécessité de réduire les dimensions des bobines d'arrêt. L'on a proposé une méthode servant à calculer les valeurs de ces bobines d'après les niveaux de bruit émis.

Calculs relatifs aux conducteurs en ' groupes ' ... 408

L'application de formules approximatives peut être facilitée par le concept de " rayon moyen équivalent " dans les calculs qui se rapportent aux caractéristiques d'inductance et de capacitance pour les conducteurs en groupes. Dans le calcul de l'intensité de champ superficiel et de tension de rupture critique, le terme " rayon équivalent " est substitué en tant que facteur; les valeurs de ce facteur sont données par des courbes.

Alimentation d'électricité dans une teinturerie ... 415

La modernisation du matériel électrique dans une teinturerie a été entreprise de concert avec l'adoption d'une implantation plus avantageuse de l'installation électrique. Deux turbines de 5,5 MW à contre-pression entraînent des générateurs qui produisent la majeure partie de l'électricité requise par l'usine. Le déséquilibrage est pris par le réseau du service local d'alimentation en électricité. La standardisation des dimensions de moteurs et de l'appareillage de commutation s'est avérée avantageuse. Les lampes à filament de tungstène dans les accessoires d'éclairage à l'épreuve des flammes ont été converties au type fluorescent à mercure.

Réglages de la commutation dans les moteurs à courant continu 418

Les réglages effectués dans les derniers stades de fabrication des moteurs C.C. jouent un rôle vital dans l'obtention de bonnes caractéristiques de commutation pour ces moteurs. Certains des réglages doivent être effectués à nouveau en cours de service.

In dieser Nummer

Brummen von Leuchtstofflampen 403

Das von den zur Steuerung von Leuchtstofflampen verwendeten Geräten ausgehende Geräusch ist teilwise magnetostriktiver Natur. Es lässt sich durch sorgfältige Konstruktion und durch die Verwendung magnetischer Kreise mit niedrigen Flussdichten vermindern. Diese Lösung wird jedoch durch die Notwendigkeit erschwert, die Ausmasse des Vorschaltgerätes in engen Grenzen zu halten. Es wurde bereits ein System zur Dimensionierung der Vorschaltgeräte nach Massgabe der erzeugten Geräuschpegel vorgeschlagen.

Bündelleiterberechnungen 408

Der Begriff " equivalent mean radius " bei Berechnungen des Induktanz- und Kapazitanzverlaufs in Bündelleitern kann die Verwendung von Annäherungsformeln erleichtern. Bei der Berechnung der Oberflächenfeldstärke und der Durchschlaggrenzspannung wird der " equivalent radius " als eingesetzt, dessen Werte aus Kurven hervorgehen.

Elektrizitätsversorgung in einer Farbenfabrik 415

Die Modernisierung der elektrischen Vorrichtungen in einer Farbenfabrik wurde mit der Durchführung eines zweckdienlicheren elektrischen Anlageplanes verbunden. Zwei 5,5 Megawatt Gegendruckturbinen treiben Alternatoren, die einen grossen Teil des Kraftbedarfs der Fabrik liefern. Symmetriestörungen werden vom örtlichen Kraftnetz absorbiert. Die Nomierung der Motorgrössen und der Schaltvorrichtungen hat sich als durchaus lohnend erwiesen. Die in schlagwettersicheren Leuchten untergebrachten Wolframdrahtlampen wurden durch Quecksilberdampf-Leuchtstofflampen ersetzt.

Kommutierungsnachstellungen bei Gleichstrommaschinen 418

Nachstellungen, die im Endstadium der Herstellung von Gleichstrommaschinen vorgenommen werden, spielen biem Erzielen guter Kommutierungskennlinien in solchen Maschinen eine grosse Rolle. Manche dieser Nachstellungen müssen später während des Betriebs wiederholt werden.

Noise from Fluorescent Lighting 403
by W. R. Bloxsidge, M.I.E.E.

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Bundle Conductor Calculations 408
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ELECTRICAL
TIMES

ESTABLISHED 1891

THURSDAY, 21 SEPTEMBER, 1961

Editor and Managing Director:
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News Editor:
T. W. WRIGHT

Comment

HARD-UP STANDARDS

British Standards Institution is suffering, like all voluntary organisations, from money-centred growing pains. Its success over recent years has been self-feeding so far as volume of work is concerned and, with a record number of standards published in its last financial year, it is barely covering costs. The annual report describes the problem as "urgent," and it is certainly one which demands the attention of industry. In the year ended 31 March last, the work of BSI was valued to the remarkable extent of £207,000 in terms of sales of its publications. This was nearly as much as industrial and other supporters subscribed. Lagging behind from its once pound-for-pound contribution to the pool came the Government with a £170,000 grant that is to be pegged at the same level for the next two years. How is the standardisation effort to be continued without restrictions on the secretariat that will inevitably be imposed if income is not increased? It is easy enough to say that industry should subscribe more, but not so easy to secure this at the level of individual firms. The last subscription increase cost the Institution a substantial number of members. On the other hand, industry values the work of BSI enough to spend what must be a frighteningly high sum in worth of engineers' and other executives' time working on standards in meetings at home and overseas. There is little logic in making this effort of less ultimate worth by cutting direct contribution. It is hard to resist the feeling that the Government has chosen a bad period for keeping down its grant. Now, more than ever, a full British effort at the table of international standardisation is important.

BEYOND GAS COOLING

It has been apparent for some time that the UK Atomic Energy Authority has been extending its thinking on nuclear power stations to include the possibility that the gas-cooled, graphite-moderated design may not be best in all circumstances. This line of thought was explained by Sir William Cook last week in an after-luncheon talk to the London Electrical Industries' Club. Sir William, who now heads the reactor interests of the UKAEA, confessed to a personal liking for the Canadian authority's pressurised tube heavy water reactor. He made it clear that the UKAEA, together with the consortia, were thinking more widely than this, but that the question whether the British nuclear energy industry should enter the water-cooled reactor market was still in the discussion stage. This pattern of a cautious evaluation of risks before moving on to the expenditure of large sums of money is understandable in the light of the industry's recent history. However,

it gives rise to concern from the national standpoint. The danger involves the length of time it may take to make a nuclear reactor employing water cooling, from the time a decision is taken to go ahead. Sir William himself was depressing on this point. He sketched the lessons to be drawn even from the work on gas-cooled reactors—the AGR, next stage to the Calder design, could not be in service for the CEGB before 1969, he suggested; nor a fast-breeder reactor before 1975, at present rates of progress. His conclusion was that much of the drive has gone from nuclear development; drive that originally came from defence considerations, and could not expect to be renewed from the same cause. The implication seems to be that the Government is putting appreciably less into nuclear development than the UKAEA thinks desirable. It is not easy to check such a conclusion, since the UKAEA financial statement is purposely mixed up to disguise its defence component and make interpretation effectively impossible.

COOKER TRENDS

These are exciting times for enthusiasts for electric cooking. The days when gas was clearly in the lead are past, and at any time now the gradual approach of production of electric cookers to those of gas will reach the equality point. For the first half of the year, electric cookers accounted for 47% of the combined production, compared with only about 20% a decade ago. Constant improvement of cooker design has more than matched the efforts of gas competitors and, in particular, the change in boiling plate design has clinched advantages in electric cooking that were always attractive. This change is reflected in the rapid increase in the proportion of cookers that are sold with four plates. From being for long a small proportion of sales, they have rocketed in a short while to approaching one-half of all cookers sold. The days of shuffling saucepans seem to have been left behind by housewives who cook electrically, just as the time of automatic control of cooking utensil temperature, for long available on the Continent, seems to be approaching in the UK. Until that advanced stage in kitchen automation is reached, the availability of timers seems to be holding up as an outstanding attraction in electric cooker design. Built-in cookers and various types of separates seem unrelated to the usual British type of house layout and to the building costs involved; such is the experience of leading manufacturers. With so much to talk about, in terms of design details, advertising cookers easily takes on more attraction than advertising the idea of electric cooking. Whether it is the better approach for the supply industry or, indeed, for cooker manufacturers is not so certain.

FINANCING WORLD ELECTRICITY

Activity of the International Bank for Reconstruction and Development — the World Bank — in electrical engineering projects continues to grow apace. The review of the Bank's loans which is made in the recently published annual report underlines this. Details are given on another page, but the global figures are impressive. Loans made during the financial year reviewed aggregated about £45 million, effective in Africa, Asia, South America and Europe. They are estimated to cover additions to generating capacity of more than 1,000 MW, besides extensive associated transmission and distribution projects. Added to the effect of this lending on the international electrical machinery industry must be the sizable number of loans concerned with railways, in which electrification figures prominently. The year's work brought total outstanding loans for electricity supply to over £600 million and those for railways to £340 million. Yet it is not only in making work possible that the Bank ranks as important. The investigations it conducts before agreeing to loans, and the conditions it commonly imposes when loans are made, both operate to improve the efficiency of the undertakings at the receiving end. It is not uncommon for the Bank's technical and commercial staff to impose on electricity undertakings higher standards of technical operation and financing practice than these undertakings would feel able to accept at an early stage of development in the absence of such help—and pressure—from outside. Better standards at the beginning lay the foundations for easier running when progress has been achieved to the position where growth can continue without special external aid.

NOISE OVERHEAD

Noisiness of chokes in fluorescent fittings, something of a problem with early installations of fluorescent lighting, has not been so troublesome of late. However, there are certain trends in lighting at present which suggest that noise will again become a consideration requiring attention. In part, this arises from the attention being given to ever more compact fittings, which tempt designers to work their choke cores at higher flux densities; in part, it is the effect of increased illumination levels and so greater concentration of fittings in a room. One way of meeting this problem, advocated in the article that begins opposite, is the grading of chokes for sound quality. A busy office of a factory is unlikely to be troubled by relatively noisy chokes. In a private office or a schoolroom the buzz that they generate may be a serious distraction. What would remain to be decided is whether the various "quietness quality" ratings could be obtained by selection from run of production chokes, with a premium paid for the quieter variety; or whether quietness would need to be designed-in, the quieter component being intrinsically more expensive. Probably some compromise between the two approaches would be applicable, with perhaps two different designs in a given physical size covering five or six quietness levels.

This week's quick summary of electrical news faces advertisement page 20

Noise from fluorescent lighting

SHOULD BALLAST UNITS BE RATED FOR SOUND EMISSION?

by W. R. Bloxsidge,* M.I.E.E.

THE fluorescent lamp is an electric discharge device and, as such, requires a ballast to control the current through it and to assist in starting. For operating fluorescent lamps on supply voltages between 200 a.c. and 250 a.c. the usual form of ballast is a choke or a reactor consisting of a copper winding on a laminated steel core.

Like all other electromagnetic devices for use on alternating current, these assemblies are a source of noise. Most people quite readily accept a considerable amount of noise from typewriters, office machines, air-conditioning systems, refrigerators and even electric clocks, but the tungsten filament lamp, to which we have been accustomed for the past 50 years, is a silent device so noise from a lighting installation tends to be more noticeable and may give rise to complaints.

Causes of Noise

Any electromagnetic device, such as a transformer or ballast operating on an a.c. mains, is inherently liable to be noisy to a degree dependent upon the power it handles and also on its design. Much can be done in the design stage to keep the noise level of a fluorescent lighting installation to an acceptable low level. In control gear, account must be taken of the fact that the current through the tube does not follow the sinusoidal waveform of the supply voltage. The nature of the electric discharge is such that it gives rise to harmonics and the resultant current, passing through the ballast, generates noise at twice the frequencies of the harmonics. In a 50 c/s fluorescent lamp circuit, the most prominent are the third and sixth harmonics, generating at 300 c/s and 600 c/s, respectively. The audible spectrum extends upwards and frequencies over 2,000 c/s can be detected.

As the fundamental 50 c/s current predominates, it might be expected that most of the noise heard would be at the 100 c/s. But the ear is relatively insensitive to sound at this frequency and is far more sensitive to frequencies between 1,000 c/s or 5,000 c/s. Unless, for reasons of bad design or poor assembly, some part of the core or case is free to vibrate, noise which is audible from a ballast will mostly be at the higher frequencies.

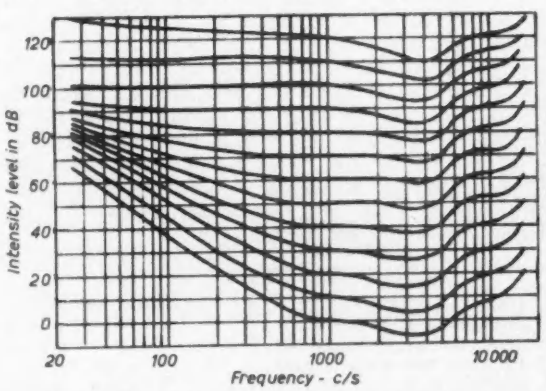

Fig. 1. Loudness level contours for pure tones. Each contour corresponds to a loudness level ranging from 0 to 120 phons in ascending order

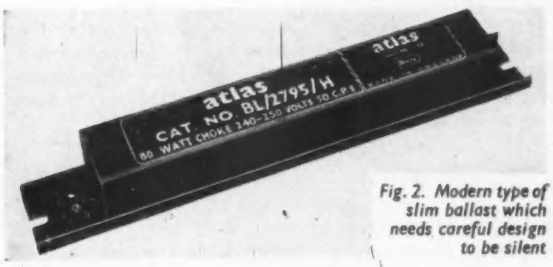

Fig. 2. Modern type of slim ballast which needs careful design to be silent

Even with good clamping and thorough impregnation, core noise cannot be completely eliminated. It is well known that magnetic materials change their dimensions under the influence of a magnetic field and this phenomenon, known as magnetostriction, has been utilised in echo-sounding equipment. Though the effect is most pronounced in nickel and nickel-iron alloys, it occurs to an appreciable extent in ordinary electrical steel and is a recognised source of noise in transformers and allied electrical apparatus.

Practically all noise produced in a ballast originates in the core, though the amount expended as sound energy is infinitesimally small compared with the remainder of the core loss which appears directly as heat.

Core losses increase steeply as the material approaches saturation. A ballast with the core operating near saturation will introduce further distortion of the current waveform, adding to the harmonics already present in the circuit. Uneven air-gaps and leakage between limbs may produce conditions in which part of the magnetic circuit is saturated, with the same effect. A ballast designed to operate at a moderate flux density in the core not only has the advantage of good regulation and low losses, but is also likely to be quiet in operation.

Design Limitations

Today, more than ever before, design is a matter of compromise between cost and performance. Modern styling demands slimmer fittings. But equally significant is the fact that slimmer fittings require less steel. Slimmer ballasts are less efficient and, to save material, higher flux densities may have to be used. Special core designs are devised to avoid punching scrap and to minimise assembly cost.

Sequence start circuits, in which two lamps can be operated from one ballast, may almost halve the cost of control gear in a suitable installation. Again, however, special transformer designs and circuits are required to produce a compact ballast at an economic price. This usually involves leakage reactance transformers in which parts of the magnetic circuit may be at or near saturation.

* Atlas Lighting Ltd.

Another factor which must be taken into account when considering the noise factor in fluorescent lighting installations is the increasing use of 8 ft tubes. It follows, of course, that larger ballasts, handling more power, cannot be as quiet as the smaller units but, in addition to this, starterless gear is generally used for 8 ft tubes and leakage reactance transformers are then required to step up the supply voltage and to provide cathode heating.

It could also be shown that the audible output of one large ballast is greater than the total output of a number of smaller units but enough has been said to make the point that it is now desirable to furnish the user not only with polar curves and temperature data but also with "noise" data.

For reasons which we need not go into here, this situation was reached some time ago in America and a system of ballast noise ratings devised by the General Electric Company.[1] Similar schemes have since been adopted by other American manufacturers.

Noise Rating

Noise levels are expressed in decibels above a reference level which corresponds to the average person's threshold of hearing. As an example, a whisper at a distance of 4 ft corresponds to about 20 db. The response of the ear to volume is not linear and its characteristics also vary with the frequency of the sound. Fig. 1 reproduces a series of curves originally published in America as a result of subjective measurements with telephones.[2] As a result of work done under the auspices of the International Organisation for Standardisation, some data has recently been published on ear response under specified conditions in a free field.[3]

The noise level meter consists, in brief, of a microphone combined with an amplifier, detector and meter, designed to give r.m.s. indication. Frequency-weighting networks are incorporated by which the overall frequency characteristics may be adjusted to agree approximately with the equal-loudness curves of the average ear, for pure tones, at certain intensity levels. The instrument is graduated in decibels so that the readings for a pure tone of frequency 1,000 c/s is equal to the intensity level of that tone expressed in decibels above a reference intensity corresponding to an r.m.s. sound pressure of 0·0002 dyne/sq cm. The instrument reading produced by any other sound is then referred to as its "noise level" in decibels.[3]

Measuring Noise

The generally accepted method of measuring the noise emitted from a fluorescent lamp ballast is as follows. The ballast is suspended in a suitably shaped box lined with sound-absorbent material. Readings are taken at a number of positions with the microphone at a specified distance from the surface of the ballast. If necessary, corrections are applied for the ambient noise level and the result is taken as the root-mean-square of all the readings.[4]

This "classical" method serves very well for what might be described as "conventional" designs of ballasts and transformers which are relatively quiet in operation and little affected by the fittings in which they are mounted. However, for the more advanced design it is necessary to use a method more closely related to working conditions.

The obvious difficulty here lies in the fact that working conditions cannot be precisely defined. Fittings vary widely not only in their optical and thermal characteristics but in their effect upon ballast noise. It is generally agreed that the simple, open troffer type of fitting is one of the most troublesome in this respect. By virtue of its shape it acts as quite an efficient acoustic amplifier and radiator. At worst, it can have a reasonance of its own which may respond to the sound from the ballast or be excited by stray magnetic fields.

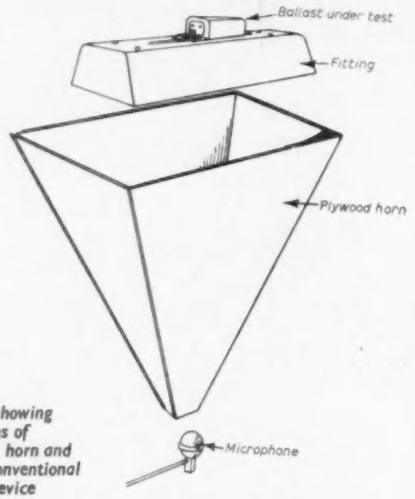

Fig. 3. Diagram showing respective positions of fluorescent fitting, horn and microphone in a conventional noise measuring device

In the General Electric system of noise grading, ballasts are measured on a dummy fitting designed to simulate these characteristics. The mounting is arranged to avoid variations caused by fortuitous contact between the ballast and fitting, the latter having a fundamental resonance in the region of 100 c/s, and beneath it is suspended a plywood horn which gives an amplification of 12 db and directs the sound to the microphone (Fig. 3). Ballasts can then be divided into a number of categories designated by the letters A to F according to their typical noise levels as measured on this apparatus.

This information is used to prepare a table giving recommended ballast noise ratings according to the location of the lighting installation. An example is given below.[5] Other American manufacturers have taken up the scheme and have published their own tables.

Environment	Noise level db	Rating
Studio, Church, Country residence	20-24	A
Evening School, City residence, Office ...	26-30	B
Public library, Study hall	32-36	C
Classroom, Professional office	38-42	D
Noisy residence, Business office	44-48	E
Noisy office, Store, Factory	50-62	F

It has to be agreed what constitutes "acceptable" ballast noise levels under various conditions of surrounding noise. It is suggested that, as a basis, it could be assumed that ballast noise level should not exceed ambient noise level. This, of course, is a compromise and does not take into account a number of variables but it would, at least, provide a starting point. This is, of course, already a controversial subject, but there are those who hold the opinion that British manufacturers now have sufficient experience in this aspect of the design of lighting installations to formulate a scheme of their own. It might not necessarily be in accordance with American practice (there are differences between British and American conditions apart from lighting levels) but, undoubtedly, it would be of benefit to both user and manufacturer.

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Reactor future

U.K.A.E.A. INTEREST IN WATER-MODERATED DESIGNS

AN insight into UKAEA thinking on power-producing nuclear reactors was given when Sir William Cook, the Member of the Authority for Reactors, spoke to the Electrical Industries' Club in London last week. He made it clear that the faith of the Authority in the gas-cooled graphite-moderated reactor is not blinding it to the claims of other types.

However, Sir William began with attention to the familiar gas-cooled reactor, and noted that the higher-temperature, advanced gas-cooled reactor was soon to go critical. Uncertainty about the working life possible with the graphite cores of reactors of this type was rapidly being resolved with a favourable prognosis, he implied. His own opinion was that the AGR type of reactor could give kWh costs 10% below those for electricity generation in conventional power stations.

Looking further forward along the development chain of gas-cooled reactors, Sir William mentioned the high-temperature, gas-cooled reactor, the subject of experiments at Winfrith Heath. For reactors of this type, ceramic matrix fuels were needed and these might become useful for the AGR concept as well.

Despite the promising situation about the AGR, Sir William admitted that it would be presumptuous to say the UKAEA had developed the best of all possible reactors. Development had not been carried far enough to compare the potential of light-water-moderated-and-cooled and gas-cooled reactors. At present, the comparison had to be made on technical factors only. In smaller sizes, below 150 MW output, however, the light-water reactor seemed more attractive than its gas-cooled counterpart.

Water-moderated Designs

The Canadian heavy-water-moderated-and-cooled reactor was in Sir William's personal view possibly the best yet. It used pressurised tubes rather than a single pressure vessel, and was typically a low fuel cost, high capital cost design. Modifications to permit boiling and some degree of superheat to the water might bring further improvements.

In the UK it was recognised that it was not acceptable to stand apart from such developments. Studies were being made of a steam-cooled, heavy water (SCHW) design. There was co-operation with the Canadians; but significant progress would come only if a reactor were built. Before deciding whether to build such a reactor, the UKAEA was taking as good a look as it could over all water-cooled systems. In this examination of other systems, the Authority was working in close association with the three consortia of manufacturers.

This statement led Sir William to remark that the Authority's collaboration with the consortia was extremely close. This was particularly so in the work to decide whether the UK should enter the water-cooled reactor field. Such a step might open the way to the export market.

One aspect of reactor work which Sir William said worried him was the long time taken to make and prove a design of reactor. It was impossible to avoid the conclusion that the original stimulus had been dwindling. That stimulus had been provided by the defence programme.

Looking at the position as it was today, he suggested that if the CEGB decided to use the AGR design, the first CEGB station could not be operational until 1969. The fast reactor at Dounreay, an experimental station, ought to be generating 20 MW before the end of the year. A full-sized fast reactor could not be built on the basis of this experiment alone, and it would be 1970 before the first intermediate-sized fast reactor could be operational as a forerunner to a fast reactor as part of the supply authorities' generating schemes. So not until 1975 was there hope of a fast reactor in the civil programme.

Sir William contrasted these time intervals with the 20 years taken for the USSR to progress from captured German rockets to the present stage in space exploration. In the past, defence needs and war-time years had provided the climate for fast technological advance. But if war came in the future, it was unlikely that it would last sufficiently long for a significant amount of technical development to be achieved. This seemed to indicate a need for the governments of western nations to devote more resources to developments in peace time.

Fusion Power Progress

CONTINUED confidence that controlled nuclear fusion will become practicable as a power source was expressed by scientists meeting at an International Atomic Energy Agency conference on plasma physics last week. But most of the experts, from 29 countries and six international organisations, agreed that it was not yet possible to say how long the development period would last.

A USA scientist who summed up the theoretical results discussed at the conference, said he believed that "in 20 years, mankind will have solved the problem of controlled nuclear fusion." The leading Russian expert expressed his opinion that "we are forced to recognise that during many years of intensive work, only the first preliminary stage has been completed on the road to our great purpose."

Instability of the high-temperature, extremely low pressure highly conducting "plasma" in which thermo-nuclear reactions can proceed is the key problem to which physicists have been devoting their attention. The conference showed that theoretical physicists had failed to find any fundamental reason why a plasma fusion reactor should not be possible—and they have been looking hard for such a possibility.

Those attending the conference suggested that a meeting on plasma physics should be organised again in 1964.

New data systems

LATEST ENGLISH ELECTRIC

General view of the English Electric KDN2 general purpose data processing system undergoing tests. This is a versatile, low cost installation

INDUSTRIAL computers are growing up. No longer are they referred to as "computers" in informed circles; they are "data processing systems." This is an important and significant step, for it signalises that stage of development where, on the one hand, the designer approaches his subject with the needs of industry in mind and, on the other, industry not only shows its ready acceptance of computers but is also able to define requirements in terms directly applicable to computer techniques.

In the English Electric Computer centre at Kidsgrove, where the first DEUCE digital computer was completed in 1955, three new systems have been developed during the past two years, the KDF9, KDP10 and KDN2. In each case the approach to design has been that of feeding in information in a form which is in terms common to industrial or commercial usage, the system making the necessary conversion from decimal to binary code for calculations and back again automatically. To keep pace with the high speed of the computer section, ancillary equipment, such as tape readers, printers, etc., have been speeded up by various means with the result that the whole system can be applied more economically and, in some cases, the time shared by several independent programmes simultaneously.

The KDF9, introduced as a general purpose machine last year, is claimed to be, per unit of cost, the fastest and most powerful computer in the world. The equipment comprises a control desk with monitor printer, power supply units, input/output units, arithmetic, store and control units with associated peripheral devices, including magnetic tape units, paper tape punch, tape readers, on-line printer and punched card equipment. The system is, therefore, elastic in that the ancillary units which can be incorporated is variable both in number and choice, in combinations which meet the widest possible field of requirements. The KDF9, with a "digestion rate" of more than one million decimal digits and alphabetical characters per second, is a general purpose instrument for scientific, commercial, industrial and general purposes.

More recently, the KDP10 has been put into production, and organisations which have already placed their orders for KDP10s include the Commercial Union group of insurance companies, the Yorkshire Electricity Board and the Midland Bank. The first complete KDP10 has been installed in temporary quarters at Kidsgrove where it is being used by the company for general use, training purposes and proving facilities for customers. Ultimately it will be housed, with other of the company's data processing and control systems, in a bureau which will form part of new premises now being erected adjacent to the present factory at Kidsgrove.

The KDP10 is a medium-sized system which accepts data from tape or punched cards in its natural alphanumeric form and presents the results either as printed information

Engineer checking the tape control mechanism of an English Electric paper tape reader as used in the KDP10 system

Wiring one of the rack circuits which form part of the English Electric KDP10 data processing and control system

processing for industry

COMPUTERS IN PRODUCTION

An English Electric KDP10 data processing installation showing magnetic tape units, monitor printing unit, paper tape reader and control console

or on punched cards. It is specifically designed to cover accounting procedures and file maintenance requirements of medium to large commercial organisations and is easy to master and apply in service. As an example of the system's capacity in the service of a supply company, it will produce, ready for dispatch, 25,000 accounts a day, maintain records for 1½ million consumers, up-date records for 30,000 cash receipts and 27,000 meter readings and handle 10,000 other miscellaneous entries, all of which will occupy about 6½ hr, leaving the machine free for such other duties as stock control, staff wages, and other accountancy items. In banking, one machine will handle 120,000 accounts which may be distributed between 60 branches served by wire from one centre.

Smallest of the systems is the KDN2, a new and compact computer for general purpose applications designed to meet the need for a low cost system capable of a wide variety of tasks. A basic installation comprises only three units, a cubicle containing high-speed store, logical circuitry and power units, a control desk with paper tape read and punch units, and a cabinet incorporating the electric typewriter and associated power supplies. For on-line applications, even the last can be dispensed with.

In all three systems, the basic unit in the computers is the "Datapac" element, comprising a pair of printed circuit boards with associated miniature components and plug-in contacts which has been so satisfactory in the many DEUCE installations in service. Stores for data and programme instructions are of the transistor-driven ferrite-core matrix type with ancillary storage in magnetic tape units. Since the first DEUCE systems were produced these forms of storage unit have displaced the more cumbersome drum types while transistors have supplanted thermionic valves. As a result, the electrical demand has dropped by about 60% which, though not significant in running cost, is vitally important in that it enables units to be housed more compactly with less provision for cooling.

No less interesting are the developments in ancillary devices. Modern tape units, both of the perforated paper and magnetic type, are vastly different from earlier designs with greater speeds and capacity. All will be seen at the forthcoming Computer Exhibition.

To date, orders in hand by the English Electric for these computers total some £2½ million with about another £1 million being negotiated. Apart from these, however, the company is also making special equipment for such purposes as monitoring fuel cell temperatures in nuclear power units and controlling the positioning of hoist grabs when changing fuel elements in reactors. Those for Hinkley Point will shortly be ready for delivery. The company, of course, maintains a number of centres where its computers can be loaned, on a time basis, for customers' usage, and training centres for teaching personnel how to apply their problems to processing systems.

Datapac control equipment for close regulation of hoist levels during fuel element changing at Hinkley Point nuclear station

Adjusting the print roller of the electro-mechanical high-speed printer for the KDP10 system. This prints at 60 lines/minute

Bundle conductor calculations

EQUIVALENT MEAN RADIUS AND EQUIVALENT RADIUS

by M. P. Varshney,* B.Sc., B.E., Ing.Dr.(Paris)

THE "equivalent mean radius" for bundle conductors is defined as the radius of a single conductor which would have the same inductance and capacitance as the bundle, when located at its axis. The introduction of equivalent mean radius, in fact, reduces all calculations regarding inductance and capacitance for a bundle conductor composed of n subconductors of radius r, to that of a single conductor of radius r_{eqm}, while making use of common approximate formulae. The quantity r_{eqm} in these expressions appears in the denominator of the logarithm term. (The terms "equivalent mean radius" and "equivalent radius" should be distinguished from the term "radius of equivalent conductor" which denotes the radius of a single conductor having an area of cross-section equal to that of the total of all the subconductors constituting the bundle.)

Considering an n-conductor bundle where the subconductors are placed at the corners of a polygon of n sides, the equivalent mean radius will be

$$r_{eqm} = \{r \times (s_{gm})^{n-1}\}^{1/n} \quad .. \quad .. \quad .. \quad .. \quad (1)$$

where s_{gm} = geometric mean spacing of subconductors in the bundle and is the $\{\frac{1}{2}n.(n-1)\}$ th root of the product of $\frac{1}{2}n \times (n-1)$ independent distances between subconductors.

In the particular case of a regular polygon of n sides of length s:

$$r_{eqm} = \{r \times (ks)^{n-1}\}^{1/n}$$

where $k = (s_{gm}/s)$ is a constant depending on the value of n;

or, $$r_{eqm} = r(ks/r)^{\frac{n-1}{n}} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (2)$$

It should be noted that though the arrangement of subconductors in a regular polygon is only one particular case out of the many possible arrangements, mechanical advantages tend to point to this as the most desirable arrangement. [Edith Clarke in Appendix A of her paper published in 1932[1] and subsequently made use of by a number of investigators, has denoted this distance s_{gm} by by $m_{gm} = 3/2.n(n-1)$th root of the product of an equal number of terms.]

Putting in another form,

$$r_{eqm} = k'(r \times s^{n-1})^{1/n} \quad .. \quad .. \quad .. \quad .. \quad (3)$$

where k' is another constant $= k^{n-1/n}$, and which is more convenient to use in practice. The values of k and k' are given in the following table for n=2 to 6, and can be used to determine the values of inductance and capacitance in the case of bundle conductors in a convenient manner when common approximate formulae are employed.

Table 1

n ..	2	3	4	5	6
k ..	1	1	1·122	1·272	1·431
k' ..	1	1	1·090	1·212	1·348

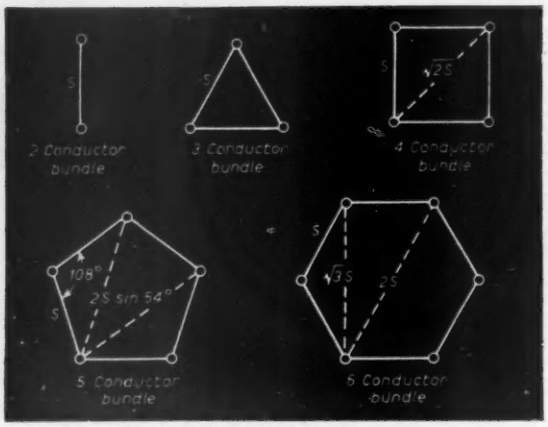

Fig. 1. Bundle conductor configuration

The main assumptions made in order to simplify analysis are:

(1) Charges on all conductors are equal.
(2) Presence of ground and ground wires is neglected.
(3) Proximity effect is neglected.
(4) Field of the other phases is not considered.

Equivalent Radius

In inductance and capacitance calculations the factor "r" appears only in the denominator of the logarithm term, but in surface field strength and critical disruptive voltage calculations there is also an r outside the logarithm term containing r in the denominator. It follows that "equivalent radius" for bundle conductors, defined as the radius of a single conductor having the same maximum surface field strength as the maximum surface field strength for the bundle when located at its axis, is different from the equivalent mean radius.

From Markt's publication[2] we can derive the following equation for equivalent radius:

$$\left(\frac{d_{gm}}{r_{eq}}\right) r_{eq} = \left(\frac{d_{gm}}{r_{eqm}}\right)^{(nr)/(1+c.r/s)} \quad .. \quad .. \quad (4)$$

where d_{gm} = geometric mean phase spacing $= 3\sqrt{d_1.d_2.d_3}$ in case of three phase lines (see Appendix), and c is a constant of the bundle polygon having values as follows:

Table 2

n ..	2	3	4	5	6
c ..	2·00	3·48	4·24	4·70	5·00

Thus, we see that r_{eq} depends on d_{gm} in addition to the factors relating to subconductors on which r_{eqm} depends.

It is therefore possible to plot curves for r_{eq}/r for different values of d_{gm}/r and s/r. The graphs for n=2 to 6 given in Figs. 2 to 6, respectively, have been plotted from

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calculated values. These graphs, within their limited accuracy, are general, and can be used for lines of any voltage and length. They should be very useful for quick evaluation of surface field strength of bundle conductor lines, with the help of equivalent radius representation.

It should be noted that the curve for s/r=15 is uppermost for lower values of d_{gm}/r, but the curves for s/r=20 and 25 smoothly take up the uppermost position with increasing values of d_{gm}/r. The spread of r_{eq}/r also goes on decreasing with higher values of d_{gm}/r.

The value of r_{eq}/r does not change much within the usually employed range of d_{gm}/r and s/r. For n=2, 3, 4, 5 and 6 the values encountered in practice range from 1·45 to 1·5, 1·85 to 2·00, 2·3 to 2·5, 2·75 to 3·00 and 3·2 to 3·55, respectively.

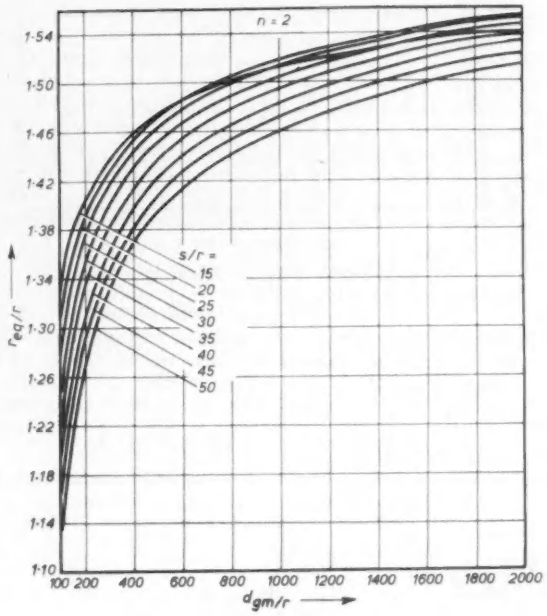

Fig. 2. Equivalent radius for two-conductor bundle

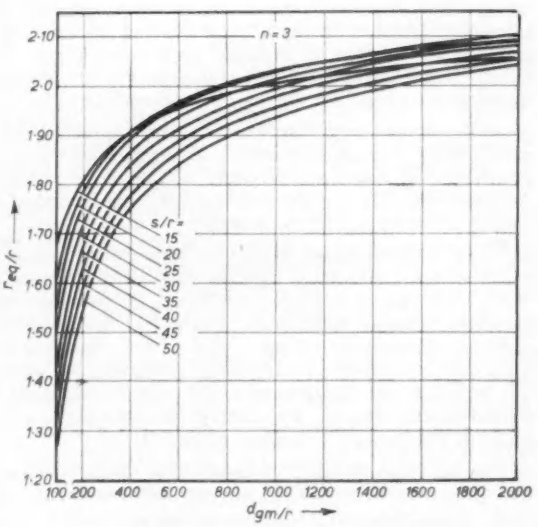

Fig. 3. Equivalent radius for three-conductor bundle

Appendix

For the more commonly used flat horizontal configuration, the geometric mean phase spacing $=d_{gm}=3\sqrt{d_1 . d_2 . d_3}$ as taken by Markt, makes no distinction between the centre and outer phases. This holds good for inductance and capacitance of a transposed line, but the surface field strength at any point is fixed and is not altered by any transposition (though corona loss per phase is equalised). It has a higher value for the centre conductor and lower value for the outer conductors as compared to that for delta configuration.

A rigorous solution for surface field strength and critical disruptive voltage calculations involves logarithm of the ratio of phase spacing to conductor radius. Ref. 3 gives a detailed

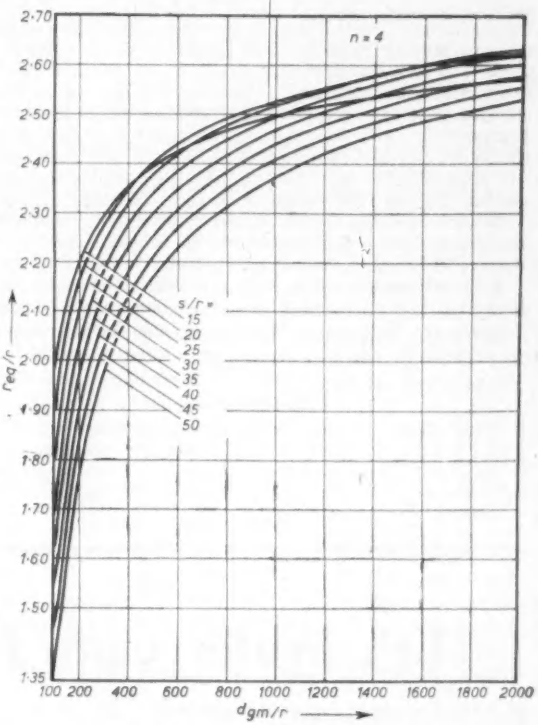

Fig. 4. Equivalent radius for four-conductor bundle

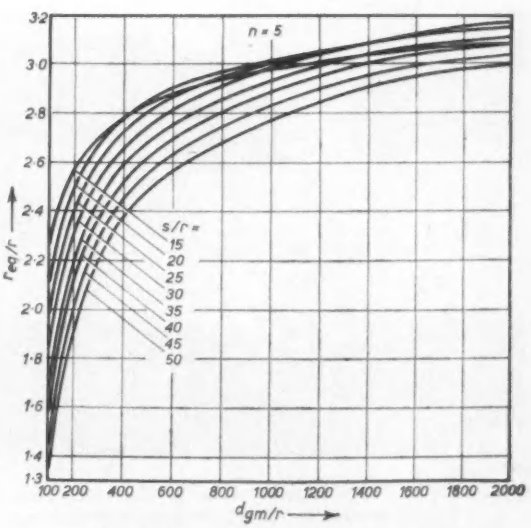

Fig. 5. Equivalent radius for five-conductor bundle

Table 3. Surface Field Strength Values

$\log_{10}$ d/r	Surface field strength in % for		
	Equivalent spacing	Centre conductor	Outer conductors
1·00	91·0	111·2	87·0
1·25	92·6	108·7	89·3
1·50	93·8	107·2	90·9
1·75	94·6	106·1	92·2
2·00	95·3	105·3	93·1
2·25	95·8	104·7	93·8
2·50	96·2	104·2	94·4
2·75	96·5	103·8	94·9
3·00	96·8	103·4	95·3
3·25	97·0	103·2	95·6

analysis of the same, where we have only to take r_{eqm} for the conductor radius in case of bundle conductors. The expression for the surface field strength for the centre conductor is simple and all that is required is to put $\log(d/2^{\frac{1}{6}}.r)$ instead of $\log(d/r)$ in the denominator, i.e., use $d_{gm}/2^{\frac{1}{6}}$ for d_{gm}. On the other hand, the conjugate expressions for the surface field strength of outer conductors are rather complicated and an approximation can be made by using the geometric mean spacing of an outer conductor from the other two conductors $=\sqrt{dd^1}=\sqrt{d.2d}=\sqrt{d_{gm}}$ for d_{gm}, the geometric mean phase spacing (Ref. 4). The values so obtained are fairly accurate.

Table 3 gives the surface field strength for flat horizontal configuration as a function of log d/r in percentage of the value for delta configuration so calculated.

Acknowledgment: The author extends thanks to final year electrical engineering degree students of the Indian Institute of Technology, Kharagpur, who helped him in calculations for plotting the curves in Figs. 2 to 6.

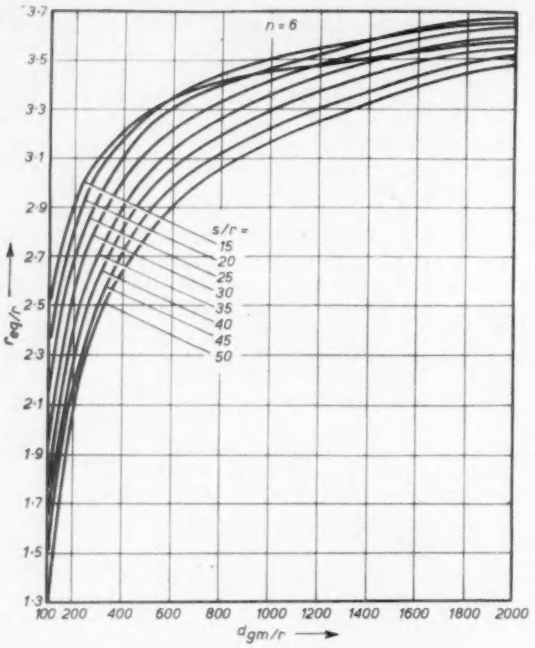

Fig. 6. Equivalent radius for six-conductor bundle

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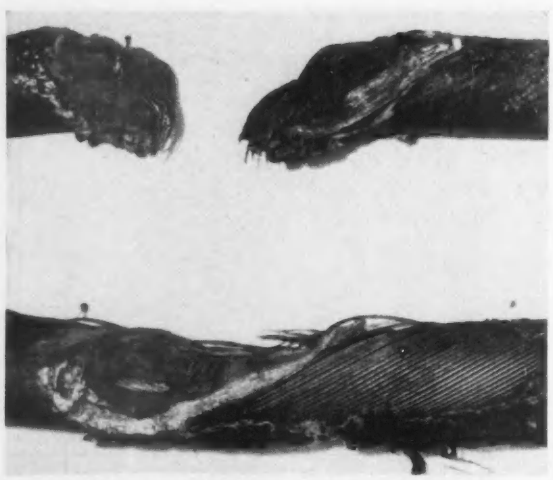
H.P. Water Cuts Cables

CABLE damage apparent in the illustration was caused by a small jet of high pressure water. The incident occurred recently on the LEB 22 kV cable system, in South London. A fault was localised by conventional loop test methods, but before starting excavation, the Board's engineers made a check test using the shock discharge method which gives a noise for location purposes. In using the apparatus connected with this test, the noise of a considerable amount of running water was heard. The Water Board and the London Hydraulic Power Co. were therefore asked to shut off mains in the vicinity.



These two 0·25 sq in. 22 kV cables, spaced as in the illustration, suffered the damage shown from a high-pressure water jet

At the point located by the tests, there are four e.h.v. cables laid 6 ft under a roadway constructed of 18 in. of concrete. The cables are three-core 0·25 sq in. p.i.l.c.s.w.a., waterproofed. They were laid in 1928, and arranged in square formation at 12 in. centres.

When the concrete cover was broken through, a large cavity was found, due to washing away of the subsoil by water. Crossing above the cable is a 3 in. diameter high pressure hydraulic main, and above one of the cables was a bolted flange joint. There was 1 ft 9 in. between the joint and 2 in. thick concrete slabs protecting the cables; yet failure of the flange joint had caused the top cable to be completely severed. The damage was caused by a fine jet with 800 lb/sq in. pressure behind it.

The top cable was in fact disused; the fault occurred in the cable below it, which was partially eroded by the water, giving an earth fault on one core.

Loans for electrical projects

WORLD BANK TOTAL $125 MILLION IN LAST YEAR

THE sixteenth annual report of the World Bank for the year ended 30 June last reveals loans totalling $610 million, of which the second largest proportion, $125 million, was for electrical development schemes. A total of 27 loans were made in many countries and of these, more than two-thirds were for investment in transportation and electric power.

During the year the International Development Association, IDA, was established. This organisation is designed to aid economic development with credits bearing less heavily than conventional loans on the balance of payments of underdeveloped countries. IDA is concerned with a wider variety of projects than are financed by the Bank, some of which, because of the Bank's more exacting financial terms, it was not able to finance. The membership of the Bank comprises 68 countries. During the year, Cuba and the Dominican Republic withdrew and Portugal and Nigeria became members.

An important event during the year was the settlement of the Indus Basin development negotiations for the development by India and Pakistan of water resources. Both India and Pakistan have embarked on large-scale development programmes which will be financed in part by the Bank and the principal exporting countries as indicated in the table overleaf.

Eight loans for electric power were made and these are outlined below. It is estimated that they will help to add more than 1,000 MW of generating capacity. Close co-operation also continued with the UN Special Fund, and during the year the final report of the survey of electric power needs and potential of Argentina was submitted to the Government and to the Special Fund. For this survey the World Bank acted as executing agency, as it also will for studies in Guatemala and Peru.

Developing Owen Falls

Prominent among loans in Africa was the $8·4 million loan to the Uganda Electricity Board for the financing of major extensions to the main transmission network. The development programme of the Board extends over five years and is intended to widen the power market, as the demand for power produced by the Owen Falls' 120 MW hydro station has failed to develop as fast as originally expected. Additional power will be supplied to the Kilembe copper mines, outlying townships, tea estates and other consumers. The programme also provides for the construction of small generating units in areas remote from the main transmission system.

Asia and the Middle East

The demand for electricity in South Western Ceylon, which includes Colombo and more than half the total population, has been growing at the rate of 11·5% per annum over the past five years and it is soon expected to reach 15%. A loan of $15 million will help meet this demand by financing generating units to double capacity of the existing system. A 25 MW unit will be added to the Colombo thermal station and a 50 MW hydro plant is to be built on the Kehelgamu River. The project, which

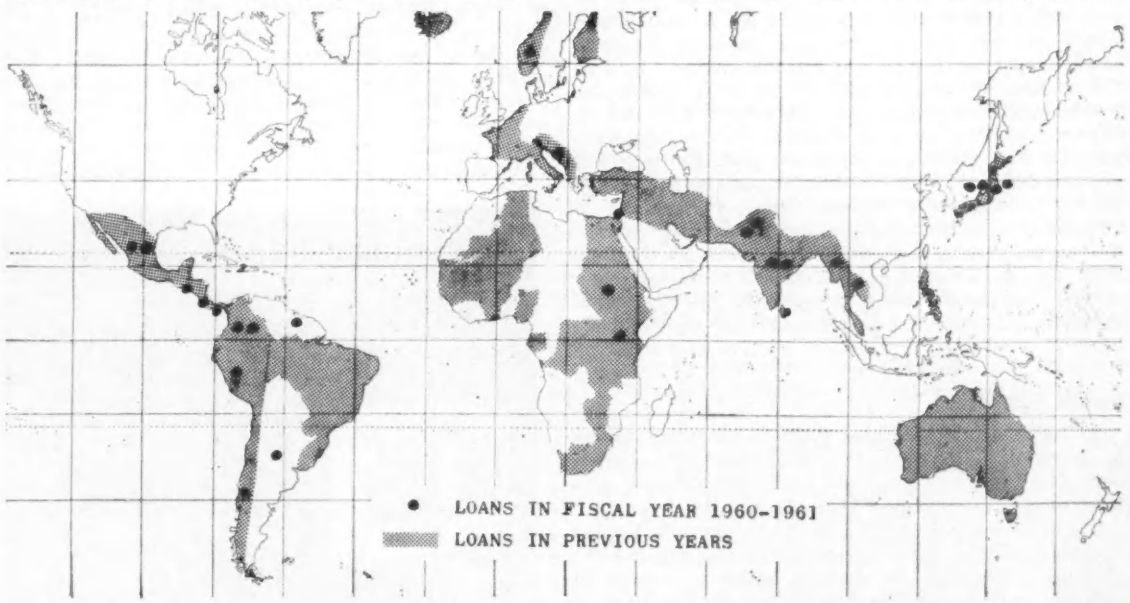


Fig. 1. Loans made by the World Bank in the last fiscal year totalled $610 million. Twenty-seven loans were made to 20 countries and territories, as shown on the map. Interest-free credits of $101 million were also made to four countries by IDA

Programme of aid to India and Pakistan for two years in millions of US dollars

Country	Indian fiscal years 1961-3	Pakistan fiscal years 1961-2
Canada	56	37·8
France	30	10
Germany	364	62·5
Japan	80	40
UK	250	42
USA	1,045	279·6
World Bank and IDA	400	77·4
Total	2,225	549·3

Bank loans for electric power generation and distribution 30 June, 1961, in millions of US dollars

Total	Africa	Asia and Middle East	Australia	Europe	Western hemisphere
1,740·9	186·4	479·3	29·3	388	657·9

also includes extensions to the transmission network, is scheduled for completion in 1964. Early in the year a bank mission also studied power development, irrigation and flood control and reviewed a number of other projects.

India received a loan of $70 million for railway development and included in the plans was electrification of 845 miles of lines in regions of high traffic density.

An electrified rail system will also result from an $80 million loan to Japan. The plans include electrification of 311 miles of express railway from Tokyo to Osaka, with trains running at top speeds of 125 m.p.h. The Kyushu Electric Power Co. also benefits through the Japan Development Bank by a loan of $12 million. The company plans to add 1,007 MW of generating plant by 1966, including a thermal station of 156 MW, using low-grade coal at Kokura.

Norway and Yugoslavia

The second and third stages of the vast Tokke hydro-electric scheme in Norway benefited by a loan of $25 million. This loan will help with the financing of plant with 410 MW capacity and also 200 miles of transmission line for Norway's new grid. Another European beneficiary during the year was Yugoslavia with a loan of $30 million. By 1965 Yugoslavia plans to double the present generating capacity of nearly 2,000 MW and to add nearly 1,100 miles of transmission lines to strengthen and extend the existing country-wide grid. The loan will aid construction of a 216 MW hydro plant at Senj in the Velebit mountains and the installation of 790 miles of transmission lines to form a network extending through five of the country's six republics. The work involves three diversion dams, 20 miles of tunnels and construction of an underground power house with three 72 MW generators, and also a concrete arch dam on the River Lika.

South America

Reference has already been made to the power survey in Argentina carried out by the World Bank. Three other countries, Colombia, Costa Rica and El Salvador also received substantial loans during the year.

The Colombia loan of $22 million is to cover the foreign exchange costs of the Guadelupe hydro-electric scheme of Empresas Públicas de Medellín, which is intended to increase electricity supplies for the metropolitan area of Medellín in central Colombia. A great industrial expansion in this area during the last 20 years has resulted in an increase in demand of 11% annually, and so far restrictions have been necessary. The first stage comprises an 18 MW and an 80 MW hydro plant to be complete by 1963, with a further 18 MW plant and three 40 MW plants to be subsequently built. The increased capacity will be met by erecting a dam across the Tenche River.

In Costa Rica, part cost of a new hydro-electric plant on the Rio Macho will be met by a loan of $8·8 million. The construction, by Instituto Costarricense de Electricidad, will initially have 30 MW output, rising to an ultimate 90 MW. In addition, 48 miles of transmission line are to be added to the central network and 9 MW of diesel-electric plant are to be installed at Colima and Limón.

Finally, in El Salvador, a loan of $3·84 million to Comisión Ejecutiva Hidroeléctrica del Rio Lempa is for the construction of a second 15 MW hydro plant on the River Lempa about 100 miles upstream of an existing 60 MW station brought into service in 1954.

Transistorised Battery Truck

UP to the present the not inconsiderable number of battery trucks which are in everyday use all share, with minor deviations, the same basic system of control; that is, a stepped resistance in series with the battery and motor to reduce the starting current surges on the batteries and to give some control of speed. Such resistances inevitably mean an uneconomic use of the battery capacity since the power dissipated in the resistances is lost as heat. Only in battery-charging facilities has there been any real variation of techniques which, in earlier and still-predominating designs, depended on an external d.c. source from a rotary or static converter.

In the new "Transitruck," developed by Smith's Delivery Vehicles Ltd., of Gateshead-on-Tyne, in collaboration with Joyce, Loebl and Co., not only has the battery-charging system been incorporated on the truck in a miniaturised form but the control of the motors is by the use of silicon-controlled rectifiers in conjunction with a transistor oscillator, thereby dispensing with resistances. The principle, akin to that of the grid-controlled rectifier, or "thyratron," enables stepless regulation of speed, from crawl to maximum. The miniaturised charger, or "Sev-charger," dispenses with a transformer, voltage transformation being effected by phase firing a controlled silicon rectifier. A new 130,000 sq ft factory is being built to produce the "Transitruck."

The new Smith's "Transitruck" battery vehicle with in-built charging equipment and silicon-controlled rectifiers for speed regulation

NOTES ON WIRING

BY MEGOHM

MANY readers, like myself, must have found much to read and digest in the review of current illumination topics in the ELECTRICAL TIMES a fortnight ago. I feel certain that many of the opinions expressed must have made the older members of the electrical industry sit up and take notice. I kept wondering when a really determined attack on our lighting habits was going to take place and I must say that if the campaign for better lighting continues in the same vein, we might indeed see some progress in this field. Bad lighting has long been one of the industry's faults, based, no doubt, on constant reminders for "economy," and continuing along these lines, for years has led us to almost a shameful position. The medical profession has always kept a watchful eye on such matters and, if by chance the news of this purge has reached their ears, they must be very interested in the whole affair too.

Lighting Quality

It has been pointed out many times before that better lighting is not just a matter of putting a higher wattage lamp into a fitting and I sincerely hope that the small contractor does not deal with the problem in this manner. The danger of such an action taking place cannot be overlooked, for it is already happening. Certain people I know have already had the answer to the problem from their local electrical shop: the answer being the new higher wattage lamp in the small size. This may have possibilities in the domestic situation, but there is still need to educate the householder in the lighting of the home. I have marvelled at some of the ideas put into use by householders, and at some of the shades with which they shroud the lamp. Yes, indeed, more light please, not only in the office and factory but in and around the home, not forgetting these dark front entrances and back-door steps where danger waits for the elderly person.

Oil Burners

During my travels I am always on the lookout for matters directly concerned with wiring, but anything electrical is of interest. Oil-burners for use with boilers come well within my range of interest, for I often become involved in their installation. I have, therefore, been most interested in one boiler house where a comparatively new type of burner is being installed and, to my way of thinking, it is one of the best *electrically* that I have seen. Normally, we see a number of indicating lights and switches mounted remote from the actual burner itself, which results in cables having to be run all over the boiler house. The new type of burner eliminates much of this. The burner itself is self-contained and is mounted on wheels for withdrawal purposes and has a series of warning lights mounted on a front dashboard. This means that any fault (e.g., flame failure or low water) is immediately indicated and the safety switches etc. go into action. Two flexible leads, consisting of flexible conduit, cables and plugs, are attached to the burners. One lead carries the cables (t.p. and n) for feeding the burner and the other lead, which has 12 cables, is used for all the thermostatic and control wiring.

Wiring from the various thermostats, pressure switches, warning relays and so on, is taken to a position adjacent to the burner and terminated in an oblong junction box. The t.p. and n mains are also wired to this box, which has two compartments each equipped with a terminal strip. On the cover of the box are mounted two sockets, one having four tubes (t.p. and n with e.) and the other twelve tubes. I think that from this description it is clear that the two plugs can be pulled out and the burner unit is completely isolated. Any maintenance can then be carried out or the burner can be wheeled away and used on another boiler.

It is obvious that the electrician's task is eased where such burners are used, for he can immediately site the junction box and proceed to wire to the controls knowing that he can complete the wiring and not have to hang on to "finish off." The flexible cables are part of the burner itself, so there is no work required on them, the cable ends having been made off onto the plugs at the factory. The whole of the control wiring is, therefore, neat and tidily terminated and all that is necessary to guarantee this is a wiring diagram from the heating engineer and the positions of the controls marked up.

I should mention that this burner is being made under licence in this country and behaves extremely well. All warning devices are "visual" on the panel and it is also possible to instal audible warnings remote from the boiler house. Also, when the burner is removed for some purpose or other, there are no loose disconnected ends left to worry about.

Earthing

My eye was caught recently by a stick-on label on the foot of a contractor's covering letter to an estimate. This was headed "Earthing" and pointed out that the estimate was based on the assumption that earthing facilities available on site will allow adequate earth fault protection by means of the equipment specified and that should conditions be such that alternative or additional provision is necessary, then an additional charge will be made to cover the costs involved. This started quite a train of thoughts in my mind. Had this firm been "caught" on some job or other, or had they gone into this vexing question of earthing and decided to put their cards on the table? Or have the instructions come from "higher up" where many instances of contractors being caught have been recorded?

It is not very long ago that I aired my views on the matter of earthing. Does the present development mean that we are going to see some action at last? I know one thing, the consultant must now ensure that the earthing arrangements are *specified* and not left to chance—or to the contractor to fathom out. I completely agree with the contents of the label and I hope to see more contractors adopting the same attitude. I wonder if these labels will be seen on tenders submitted by the contracting departments of the electricity boards?

Organising standards

B.S.I. PROGRESS IN 1960-61 REPORTED

NATIONAL standardisation continues to increase, while activities by individual companies in applying standards extends as well. That picture stands out from the detailed pages of the British Standards Institution's annual report for the year ended 31 March last, published recently. During the period surveyed, BSI passed the 300 mark for the first time in the number of standards published (301 was the total), and the 352 drafts for comment circulated represented an increase of 40 on the previous year. The magnitude of the effort involved in the international field is shown by the total of 80 meetings of LSO, IEC and CEE, committees at which BSI arranged for representation of British views.

Payment for this work is causing concern, the report makes clear. Subscription rates have been increased, but this has been offset in part by some decrease in the number of subscribing members. Meanwhile, the Government is implementing a policy of keeping its contribution constant, rather than match any increase in subscriptions secured from industry. The report characterises as "urgent" the need for more support from industry, and it continues with a statement that "anxiety must be felt for the future."

International

Aside from the worries of finance, the work of BSI continued in many fields less self-evident than the drafting and publication of new specifications. For example, the Institution was involved in the meeting between the standards organisations of the "Six" and the "Seven," which secured agreement that the two groups should co-operate in harmonising standards in Western Europe. There was general concern to avoid any technical split between the two groups.

After the meeting concerned with standards generally, there was a further meeting of those concerned with electro-technical standards. At this, it was found possible to draw up working principles and an arrangement for co-ordination with CEE. Certain matters already taken some way by the "Six" were agreed to be unsuitable for reopening. On other subjects, it was decided that the country holding the secretariat under IEC arrangements should undertake it for the trading groups as well.

Outside the European groups, BSI has always maintained close links with standardisation authorities in the Commonwealth, and the report notes that preliminary discussions are in hand for a Commonwealth Standards Conference to be held next year.

Electrical Standards

Much of the detailed standardisation work reviewed in the body of the report has already been noticed in our Standardisation Progress feature. It is notable that at the end of the year reviewed no less than 93 electrical standardisation projects were in hand.

Sometimes the interests of the committees concerned with electrical standardisation clash with those operating in other fields. An example is given in the present report in connection with small electric motors. During the revision of BS 2048, discussions were held with the committee in the mechanical engineering section of BSI concerned with keys and keyways, because of differences of opinion about specification of keyways in f.h.p. motors.

Dispute centred around the question whether, in domestic electrical appliances where motors were used, it was the practice to "assemble" parts rather than "fit" them in an engineering sense. It was argued that for this purpose tolerances on keyways could be less close than in BS 46. However, the BS 46 committee took a stand that it was undesirable that a second (lower quality) standard should be created just for electrical purposes. If it was needed, it should be fully considered and incorporated in BS 46 provided general agreement on it could be obtained. At the time the report leaves the subject, discussions were centred on the possibility of having two grades of keyway in the motor standard, one to BS 46.

Space has been given to this small and specialised question because it shows the essential concern of BSI with well defined details of engineering practice which, if not resolved, can cause much complication for users and manufacturers of engineering equipment.

Another type of clash occurs when some outside code accepts British Standards for compliance, and these change. This has happened on a few occasions with reference to the IEE wiring rules, and a case quoted in the present report concerns aluminium cables. It has been decided to recognise the whole range of aluminium conductors standardised in BS 2791 as conductors for p.v.c.-insulated cables (BS 2004) and not restrict recognition to the larger sizes permitted for installation under the current IEE Regulations.

Domestic Appliances

Activities of BEAB in domestic appliance safety testing are stated to have led to urgent attention to standards for flexible cords for use with appliances. A new specification is to be drafted. BEAB receives several mentions in the report, a feature underlining the close connection of BSI with this venture of the electrical industry. It is stated that the general parts of BS 3456, at present concerned with heating and cooking appliances (part A) and motor-operated appliances (part B) will be extended, with early promise of a part dealing with refrigerators. In preparing parts of BS 3456, close attention is given to the appropriate specifications of CEE, the International Commission on Rules for the Approval of Electrical Appliances.

BSI has work in hand on 22 electrical codes of practice. The revision of the code on electrical installations is only at the stage where comments on a draft are under consideration. Ominously, it is stated that some of them are of a fundamental character. A revision of the street lighting code is to accept a new classification of roads in terms of lighting.

Electricity Supply in a Dye Factory

MODERNISATION AT CLAYTON ANILINE'S MANCHESTER PLANT

DYE manufacturing is mainly a series of chemical mixing and reaction processes carried out in large vessels, where the contents are intermixed by motor-driven stirrers and, where necessary, heated by steam or cooled by ice. Water, steam and electricity must, therefore, be available in large quantities. Compressed air is also another particularly heavy requirement, being used for filling and emptying the vessels and conveying liquid and powdered constituents along pipelines, drying pastes in filter presses, etc.

The Clayton Aniline Co. is one of the largest dyestuff producers in the country and has been established many years. The factory area includes a number of multi-storey buildings, which house the many reaction vessels and ancillary chemical plant, and associated premises where chemical research, sales organisation and administrative functions are carried out. During the past decade, steps have been taken to modernise the layout with the object of achieving more efficient production and making better use of the site areas.

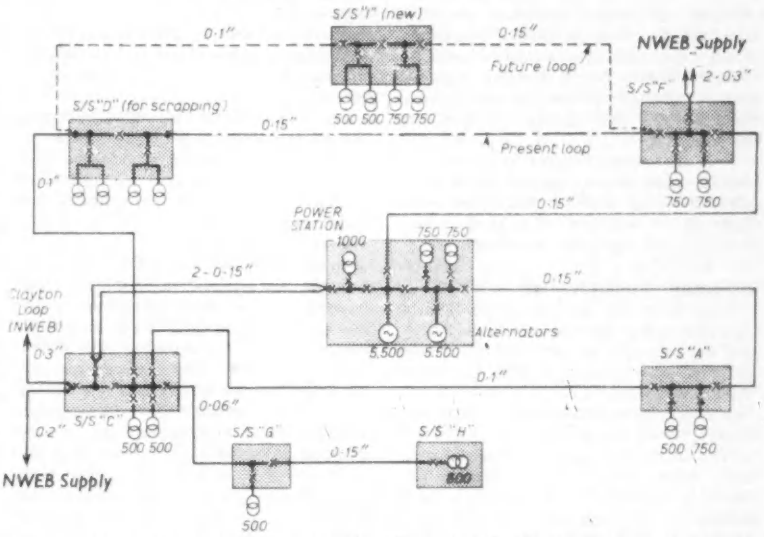


Fig. 1. The 6·6 kV distribution system at the Clayton Aniline Co's Manchester works showing present and future substations

Steam Generation

Prior to the modernisation, steam requirements were satisfied by a number of Lancashire boilers distributed around the site adjacent to the various production buildings. Electrical requirements were provided from a 6·6 kV substation inside the north eastern boundary in direct connection with the NWEB distribution system. This substation was interconnected by a 6·6 kV ring-main with other substations distributed around the site with, at one point, a further link with the NWEB system through the company's substation "F."

It was appreciated that considerable economies would be effected by centralising all steam-raising at a single point, using modern water-tube boilers, and that more efficient utilisation of fuel would result if part of the electrical requirements were to be internally generated as a complementary function of the steam-raising installation.

By 1955, a new power house had been built on the south eastern end of the site and three Richardsons, Westgarth—Foster Wheeler boilers, with superheaters and economisers, installed. Each of these had an evaporative capacity of 75,000 lb/hr m.c.r., or 90,000 lb/hr peak, at 625 lb/sq in. pressure, 800°F at the superheater outlet. Since the steam for process heating was required at 350°F, 60 lb/sq in., this was provided, in the initial stage, by "Hagan" reducing valves and desuperheaters, with a capacity of 200,000 lb/hr, supplied by James Gordon and Co. From the power house, steam was distributed around the site by overhead gantries which, later, were also to serve as the channel for the main power cables.

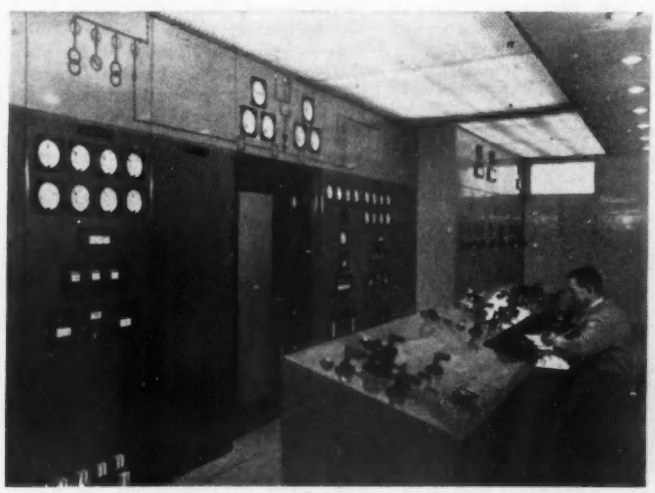


Fig. 2. The main control board, with mimic diagram, by South Wales Switchgear

Turbo-generators

In 1958 and 1959, the concluding stage, two Richardsons, Westgarth—Brown - Boveri back - pressure impulse reaction turbines were installed. Each had a capacity of 7,857 kVA at 6·6 kV, 0·7 power factor, and exhausted at 60 lb/sq in. into the process steam mains, so superseding the reducing valves and providing the main demands for the factory electrical power as well. In fact, since the controlling factor is the demand for process steam, it frequently happens that electrical generating capacity is out of balance with plant requirements and excess power is exported to, or the deficit imported from, the NWEB system by arangement.

Control of the turbine stop valve is therefore effected by the back-pressure valve to suit steam demands and not by the electrical demand, the sets being held at 3,000 r.p.m. by operation in parallel with the NWEB system. Voltage regulation in normal operation is by manual control.

Operating Conditions

There are therefore four main conditions under which steam and electrical demands can be met: (a) parallel operation with the Board, steam demands in excess of electrical, excess units exported to the NWEB system; (b) parallel operation, electrical demands in excess of steam, NWEB system supplies balance of units; (c) isolated operation, electrical demands in excess of steam, balance of steam exhausted to atmosphere; and (d) sets shut down, steam demands supplied through reducing valves and the electrical demands for lighting, etc., supplied by the Board.

It is fortunate that the first condition should arise during the winter months when the peak works demand for steam happens to coincide with peak power demands on the Board's system.

Running Arrangements

Control of the turbines and switching operations are carried out from a control console and mimic indicator panel, designed and manufactured by the South Wales Switchgear Co., in a room backing on to the turbine house and separated from it by a glass screen.

The alternators are star wound with the star point earthed through an isolating switch which is normally open except when starting up and synchronising with the Board's system. The ring-main is a 6·6 kV delta system feeding four main substations, "A," "F," "D" and "C," the last being the interconnection point with the NWEB, and two substations, "G" and "H," fed from "C" (Fig. 1).

The main switchgear in the power house is a ten-panel board, located in an adjacent switch-room, comprising 250 MVA, 6·6 kV, 800 A and 400 A, solenoid-operated oil circuit-breakers, also by South Wales Switchgear, remotely controlled from the console. There is also a static power factor correction bank of 1,200 kVA to assist in maintaining an average p.f. of 0·9.

The board controls three transformers, two of 750 kVA and one of 1,000 kVA, for provision of station auxiliaries, compressor motors and the electrical requirements of three adjacent buildings. The transformers are of the outdoor type and are coupled to the l.v. busbars through English Electric Superform switchgear incorporating off-load isolators and interlocked with the h.v. circuit-breakers.

Heavy Motors

Among the heaviest motor loads are the air compressors and the feed water pumps. The air compressors are rotary type units direct coupled to 300 h.p. squirrel-cage 440 V three-phase motors with direct-on-line starters, one supplied from each of the 750 kVA station transformers.

Since the turbines are non-condensing, there has to be a 100% provision for make-up water, which is drawn from the town mains and demineralised through three base exchange units, all of which have been supplied by United Filters and Engineering. To the demineralised water is added a dose of sodium sulphite and caustic soda while passing through the deaerators before passing on to the 29,000 gal stock tank. From here it is pumped to the boilers through one of three feed pumps, two of which are driven by 320 h.p. motors and one by a steam turbine. A measured dose of di-sodium phosphate is also pumped into the boiler drum and this treatment is so effective that, after more than three years in service, neither boilers nor turbines show any trace of internal corrosion.

Other station auxiliaries with motor drive include the forced-draught fan (70 b.h.p.), induced-draught fan (124 b.h.p.), grit-collector booster fan (6 b.h.p.), chain-grate stokers (3¼ b.h.p.), deaerator extraction pumps (7 b.h.p.) secondary air fan (44 b.h.p.), coal-handling plant (2 h.p. to 20 h.p. hoist and 1 h.p. to 6 h.p. conveyor), ash-handling plant (5 h.p. to 7½ h.p. motors), etc., all of which are squirrel-cage types with direct-on-line starting.

The station auxiliary loads are divided between the three transformers and average 388 kW. The air compressor loads are equally divided between the two 750 kVA units and average 204 kW each.

Substations

At present, the six operational substations incorporate up to four 500 kVA or 750 kVA indoor-type transformers.

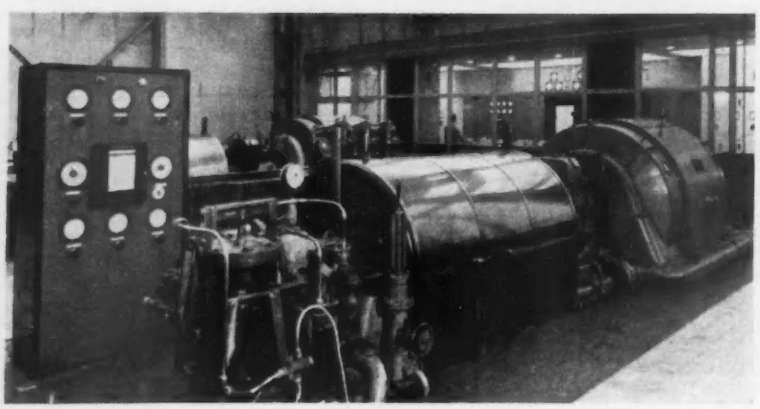


Fig. 3. View of the turbine room showing the 7,857 kVA 6·6 kV Richardsons, Westgarth—Brown-Boveri turbo-alternators. The control room can be seen in the background

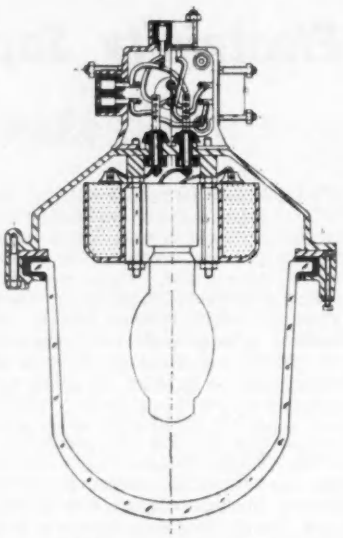


Fig. 4. Section through a 250 W flameproof well glass fitting, with "Circulume" toroidal choke in position

One of these, "H," fed from a spur, 0·1 sq in. feeder from "G," provides up to 600 kW to offices and buildings outside the perimeter of the main works. Substation "D," with the feeders solidly connected to the busbars and two 500 kVA and two 750 kVA transformers switched in pairs, is due for replacement by 1965 by a new substation, to be designated "I," when the feeders will be isolated from the busbars by switches and will form a break point in the ring-main for normal operation.

Each substation is arranged to provide l.v. supply to a number of buildings and Table 1 shows the position as it exists today and as it will be in four years' time when present building plans have been completed.

This gives a total m.d. of 4,295 kW from 50 buildings today to an estimated figure of 5,314 kW from 49 buildings in 1965.

Re-equipment plans

In the forward planning of the plant and equipment modernisation programme, advantage is being taken to standardise motorised appliances as much as possible. In the past, on account of the piecemeal expansion over the years, there has been built up a variety of sizes and makes of both motors and control gear which, on an installation comprising rather more than 4,000 motors, makes maintenance procedure quite a problem. With less than 50 of the motors over, or likely to be over, 20 h.p., it has now been decided to standardise on seven main sizes of motor, 1½, 3, 5, 7½, 10, 15 and 20 h.p., all of which are squirrel-cage types with direct-on-line starting.

Incidentally, all of the motors in the plant, including the 300 h.p. compressor motors, are started direct-on-line; the system capacity being more than sufficient to absorb transient surges.

Substation equipment is also being brought up to a consistent standard. At the moment, high-voltage switchgear is a mixture of designs from Ferguson Pailin and South Wales Switchgear ranges, with low-voltage switchgear mainly by Geo. Ellison. As each substation comes up for modernisation, the l.v. gear will be replaced by fused isolators and the h.v. gear standardised on a single pattern of o.c.b. by South Wales Switchgear. All switching will be local, the complication of remote control from the power station being considered unnecessary, at least for the present.

Table I. Present and future substation capacities

	1961		1965	
	Buildings	M.D. kW	Buildings	M.D. kW
Power House:				
Auxiliaries ...	—	388	—	388
Compressors	—	408	—	408
Buildings ...	3	146	3	146
Substation				
"A"	6	928	5	677
"C" ...	20	338	21	833
"D"	10	1,088	—	—
"F"	5	739	6	789
"G"	5	160	5	180
"H"	1	100	1	100
"I"	—	—	8	1,793

Flameproof motors and gear

Since numbers of chemicals and solvents used in dye manufacture are inflammable or likely to give rise to explosive atmospheres, all electric motors, control gear and lighting fittings in the plant rooms and locations where such conditions may exist are of flameproof pattern. In the normal course of events the buildings are sufficiently well ventilated and the enclosures so designed that the risk does not arise; nor does the toxicity of the atmosphere constitute a hazard to the operating staff. The risk is only latent and dependent on an accidental breakage of pipelines, upset of container or similar mishap. Frequent washing down of floors and equipment prevents the accumulation of corrosive or inflammable residues and a high standard of cleanliness is strictly enforced everywhere.

Maintenance

Routine maintenance on a rota basis is accepted practice, the members of the maintenance staff each having a particular section to service, check and adjust at set intervals which are planned to coincide with the weekly shut-down periods. There is no annual shut-down for holidays which can be used for a general maintenance overhaul, the plant working a 52-week year with only week-ends for active maintenance work. Both electrical and mechanical maintenance staffs work in planned co-operation to achieve the most efficient utilisation of facilities, time and equipment. In the power house, turbo-alternators are opened for examination and overhaul on a three-year rota, the first unit to become due for overhaul having recently been examined. It has been found to be in perfect condition with no traces of corrosion and wear and it may be possible to extend the period between overhauls to four or even five years eventually. Boilers come up for periodical examination at 14-month intervals. These, too, show negligible signs of corrosion, a tribute to the effectiveness of the feed water treatment.

Standardisation on the size and type of motors will, of course, enable the rapid replacement of any unit which may fail with the minimum of spares in hand, an important consideration with such a large number to maintain.

Lighting

Another feature which has come up for active consideration is the improvement of lighting levels generally throughout the plant. To improve the standard by increasing the numbers or sizes of existing tungsten filament lamps would result in a large and permanent increase in running costs. Alternatively, taking out all tungsten filament lamp fittings and replacing by fluorescent lamp units would involve a heavy capital expenditure. By converting tungsten fittings to mercury fluorescent, they can be used with an appreciable reduction in running costs, and without an excessive capital expenditure, and numbers of such conversions were carried out some time ago with the control gear housed in steel boxes mounted on the walls. A further step was taken with the adoption of the recently developed "Circulume" circular integral chokes, which can be accommodated within the flameproof housing of the Buxton approved flameproof well-glass fittings without affecting their safety. This has enabled a general upgrading in all working areas to be achieved with a considerable reduction in running charges and at a comparatively small conversion cost. Linear fluorescent tubes necessitate flameproof enclosures which are expensive both to install and maintain. In the outer staircases, a few fluorescent fittings of flameproof type have been installed, and will be retained.

The present modernisation programme is not due for completion until 1965, but, in the meantime, the engineering staff under the control of the chief engineer is constantly reviewing the plans laid down against technical progress and developments both in the dyeing and electrical industries. The ultimate objective, already well within sight, is a properly co-ordinated industrial unit, specifically designed to the needs of economic dye production, which makes the best use of the basic fuels, and in which maintenance and service costs are as low as compatible with negligible productive loss through plant breakdown.

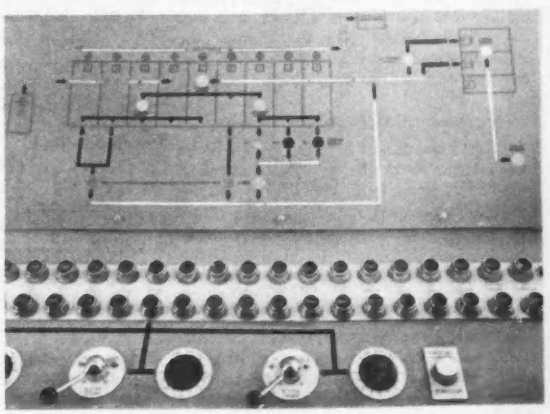
ONE-MAN ROADSTONE PRODUCTION

THE production of graded granite in large quantities, either clean or coated with bitumen or tar, for road surfacing is a major industry which is centred at the quarries from which granite is extracted before crushing and grading. In one such unit, at Malvern, Worcestershire, the controls for all the machinery are centralised at one desk where the operator can see at a glance which machinery is working and the state of the bins from a mimic diagram and Pye closed circuit television. He is, therefore, able to regulate production to suit demand, either immediate or future, and to so adjust the load on the plant that it works to maximum efficiency.

Crushing, from the first stage of 15 in. stone to graded samples from 2½ in. to granite dust, is effected in crushers at rates up to 100 tons/hr, the machines being driven by electric motors up to 100 h.p. The crushed and screened granite is transported by conveyors to the bins or to the asphalt and coated macadam plant. Metal detectors on the belt conveyors remove tramp metal.

Supply is from a 750 kVA Crompton Parkinson transformer in the substation and is distributed to a four-panel "Klad A" switchboard, one panel of which feeds a multi-motor contactor board, supplied by Allen West Ltd., which controls the lighting, metal detectors and starters for the slip-ring and s.c. motors in the plant. Push-buttons on the console control the starters and provision is made to ensure that only the correct sequence is selected.

Crompton Parkinson supplied all motors for crushers, screens and conveyors together with cables and the installation was carried out by the Midlands Electricity Board.



View of the centre section of the control panel showing the mimic diagram, pushbutton controls and selector switches

Commutation Adjustments on D.C. Machines

FACTORY METHODS OF OBTAINING SPARKLESS RUNNING

by S. Johnson

ONE of the most important tests carried out in the final stages of d.c. machine production is the check on commutation. Good commutation depends not only on the correct strength of interpole fields, but also on other factors. It is, therefore, important that all of these should be checked and adjusted if anything like the proper functioning of the interpoles is to be achieved. Assuming that errors of workmanship and inclusions of faulty material have already been rectified, the first step is to check the whole machine for proper assembly.

Air Gaps

Air gaps on both main and interpoles are checked for uniformity and conformity with the design figures as a starting point. Readings are taken at both ends of the machine, the measurements being made on the centre-line of the poles to avoid any discrepancies which might result from irregularities in the profile of the pole faces. A feeler gauge is inserted for about 2½ in. to 3 in. and the difference between maximum and minimum gap should not exceed 10% of the average air gap, closer agreement being desirable, of course. Ideally, the check should be repeated for several positions of the armature to ensure that this, too, is running true, but in practice this usually is limited to the smaller sizes of machine.

Brush Gear

Clearances between the brush boxes and commutator are the next for examination. With the brushes removed, the radial clearance between box face and commutator surface should be 2 mm ±0·5 mm. Too great a clearance is conductive to brush chatter. If the brush is a thin one, the enclosed length should be greater than if it is a thick one, for the simple reason that the thinner the contact area the greater will be the need of support from the holder.

Circumferential Brush Spacing

Radial clearances between brush boxes and commutator having been checked, the next step is to check the spacing of the brushes around the surface of the commutator. For satisfactory commutation, the brushes must be accurately and evenly spaced, since uneven spacing will give rise to the flow of circulating currents between brushes of like polarity on different carrier bars. The accepted method of checking spacing is to insert the brushes in the holders and to wrap a strip of paper, sufficiently long to pass

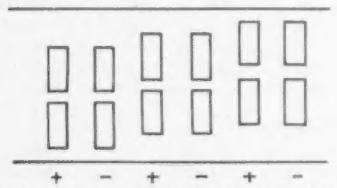


Fig. 1. Corresponding positive/negative pairs of brushes are displaced from adjacent pairs to prevent "grooving" of the commutator

under, say, two brushes, around the commutator and under the brushes which will hold it in place. With a fine, sharp pencil a line is drawn along the leading (or trailing) edges of each set of brushes. The paper is removed and the distance between adjacent lines should not differ, when measured, by more than 0·5 mm. Moreover, errors should not be cumulative, and the sum of any two adjacent spaces should not differ from the sum of any other two adjacent spaces by more than 1 mm.

Brush Overlap

On large machines with more than one set of brushes, it is usual to stagger adjacent sets of brushes across the width of the commutator to ensure that successive contact paths overlap, so avoiding the risk of grooving the commutator surface by constant wear in one restricted path. Corresponding pairs of positive and negative brushes are arranged to follow the same track, the next following pair being adjusted to run in a track which overlaps the first by up to 50% of the brush width. In all, the total number of tracks should cover the full working width of the commutator and each track should accommodate the same number of brushes (Fig. 1).

Brush Alignment

Coincident with the last test, each brush should be examined to see that it is in proper alignment; that is to say, the leading and trailing edges of the brush must lie parallel with the commutator slots.

All of the above tests are of a purely mechanical nature and may call for slight adjustment where provision for such adjustment has been made in the design. If no such provision has been made and the settings are out of limits, there is no alternative than to return the machine to the shops for resetting.

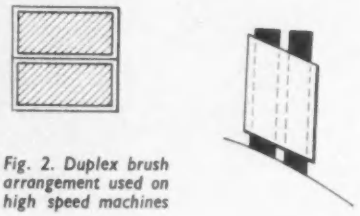


Fig. 2. Duplex brush arrangement used on high speed machines

Fitting the Brushes

The next stage is to fit the brushes in the holders and to bed them down on to the commutator. First, the brushes must be examined to ensure that the right grade has been supplied. The type is largely dependent on the surface speed of the commutator and working voltage of the machine. Medium hard electrographic brushes are the most widely used but for very high commutator surface speeds, or for low voltage machines, graphitic brushes may be specified. For high speed machines where perfect collecting of the current is difficult, two thin brushes instead of one thick brush may be used. This results in better brush contact on the commutator (Fig. 2).

The brushes are inserted in the holders and checked for fit. They should fit snugly but not tightly in the holders the tolerances to be aimed at being 0·005 in. clearance in the direction of rotation of the commutator and 0·008 in. at right-angles to rotation.

With the brushes free in the boxes, the contacting faces will require bedding down on to the commutator. This operation, which produces a deposit of carbon dust everywhere in the vicinity, is performed with fine grade glass or carborundum paper pulled between the brush face and the commutator, cutting face in contact with the brush of course, the back of the paper being held close to the curvature of the commutator so as to transfer its shape accurately to the brush face. Several brushes may be bedded together if a long enough piece of glass paper is used but care must always be taken to avoid rounding the edges of the brushes. An exception to this rule may be made, however, in the case of reaction type brushes when the leading edge should be brought to a small radius to avoid chattering as the result of a sharp edge catching in the slots between the commutator segments.

Some advocate pulling the glass paper in the direction of rotation of the commutator only, since it is thought that this gives a more accurate shape to the brush face. Though this may appear logical, since the commutator is not in motion when the brushes are being surfaced, there is no guarantee that the brush will lie in the same relation to the commutator when the latter is in motion.

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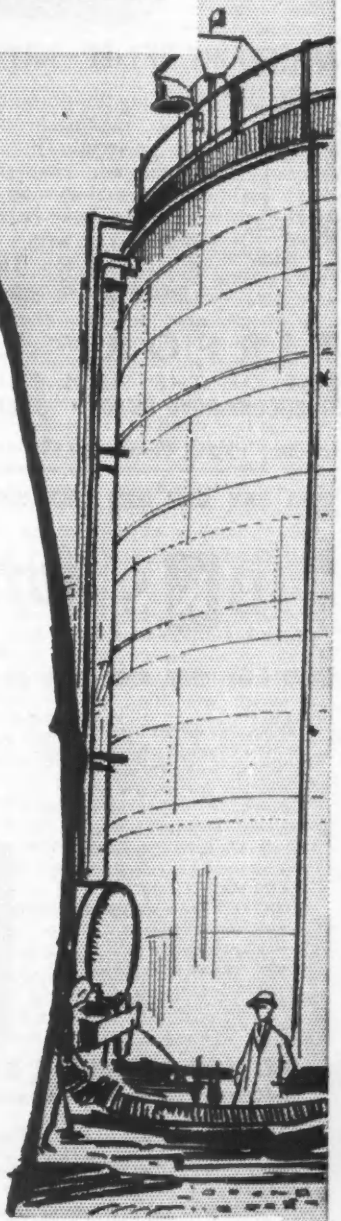

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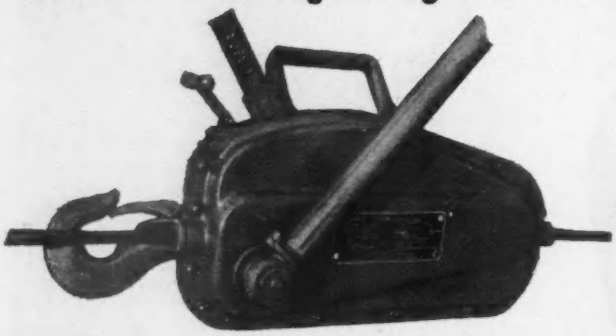

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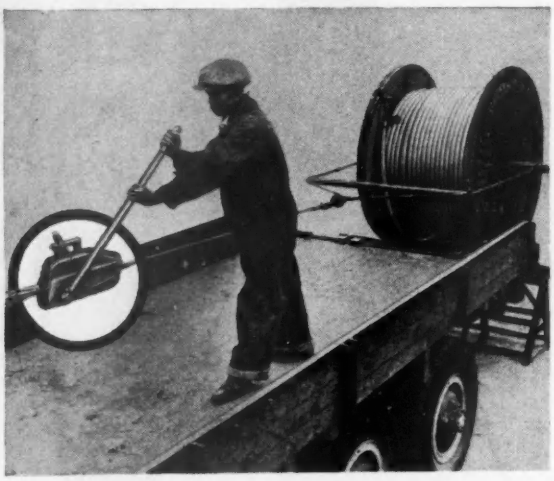

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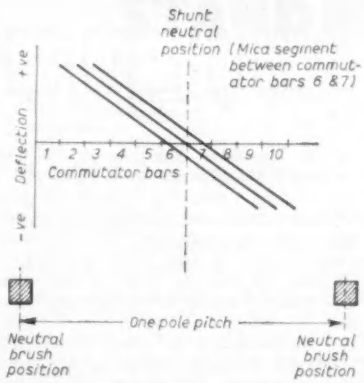


Fig. 3. The shunt "kick neutral" method of locating the correct sparkless position of the brushes

The method is, therefore, not necessarily more dependable than pulling the paper backwards and forwards. In any case, the final surfacing will be done by the commutator itself during the first few hours in service.

After all of the brushes have been bedded, it is imperative that the carbon dust be carefully and effectively blown out of the brush boxes, commutator crevices and other cavities in the vicinity. A pressure of 50-80 lb/sq in. should be adequate using a $\frac{1}{8}$ in. dia nozzle. Higher pressures may damage the insulation. Accumulations of carbon dust in the brush boxes may, in time, impair commutation through closing up the clearances and preventing the effective maintenance of the proper brush pressure. Moreover, carbon dust films between points of different voltage on the surface of insulation may cause flash-over and consequent damage.

Commutator Smoothing

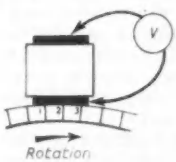
It may be that the surface of the commutator is not perfectly smooth or circular. In the latter case, any departure from circular form can be detected by placing a short insulating rod on the brushes while the motor is running and feeling if there is any rise or fall. If the ovality is not excessive, it can be rectified—or any surface scratches removed—by applying a commutator stone to the surface while running. This stone, which is of extremely fine grade, has a surface of the correct radius and is provided with handles for manipulation. It must be firmly applied to the commutator by hand while the machine is running at the normal speed and held there until the irregularities are removed. If a stone is not available, then a block of wood, shaped to the correct radius, with a surface of the finest glass paper may be used instead. In no circumstances should carborundum paper be applied to commutator surfaces since the soft copper has a weakness for picking up the hard, diamond sharp particles and retaining them embedded in the surface. After smoothing, the slots must be examined for any proud mica and under-cut where necessary. Finally, every trace of metal powder must be blown clear from the vicinity.

A freshly stoned commutator has a bright coppery surface which is relatively soft but, in time, it acquires a deep brown patina from constant friction with the carbon brush and heating by the passage of current which produces a durable protective film. Breakdown of the film through various causes—exceptionally dry atmosphere is one—is accompanied by a "singing" sound which, if allowed to continue, will result in deterioration of the protective patina and "picking" of the commutator surface by the brushes. An old, but effective, remedy is to apply a touch of candle grease over the surface and this will usually serve as a bridging palliative until the conditions for re-establishment of the patina reassert themselves.

On high voltage machines, stoning should be done when the machine is not alive but is being turned by another motor or prime mover. Medium and low voltage machines can be stoned while running under their own power.

Brush Pressure Setting

We have now reached the stage at which the brush spring pressures can be set prior to running for electrical tests. To avoid unequal electrical loading, the spring pressures applied to each brush must be uniform. Since contact voltage drop is a function of spring pressure applied to the brush, uneven pressures will result in uneven current loadings of the brushes. With the ordinary standard grades of carbon brush, rectangular in cross-section, the usual order of pressure is 2½-3 lb/sq in.



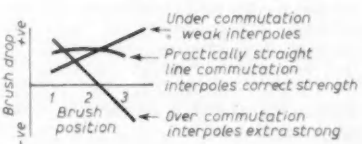


Fig. 4. Brush drop graph for determining interpole strength

The pressure can be tested by a small spring balance with a crocodile clip attached to the hook, the clip being applied to the flexible tail as near to the point of connection with the brush top. A thin strip of paper is inserted under the brush and the brush is then tensioned against its holding-down spring by the pull on the spring balance until the paper can just be pulled clear. The reading on the spring balance is then the spring pressure on the brush-commutator face. With all brushes equally set, the machine is ready for the electrical tests.

Brush Arm Position

The first stage in the electrical tests is to establish the correct position of the brush arm. In most cases the brushes and their associated gear are mounted on a carrier ring which enables a few degrees of rotational movement to be made by the test engineer in establishing the right position for the brushes in relation to the poles. In all machines with interpoles, the proper position is one in which no current flows between adjacent commutator bars when the slot between them lies midway across the brush. That is to say, in this position, the two arms of the winding terminating in the commutator bars lie midway between the North and South poles of the main field magnets so that little or no e.m.f is generated in them.

With the armature stationary and open circuited (brushes disconnected), a voltage of about one-fifth normal terminal volts is applied across the shunt field. A low reading voltmeter is connected across one pair of brushes and the deflection of the needle noted when the field circuit is opened and closed. For the correct position, there should be little or no deflection and the brush ring is turned until this position is found. This is the classical "kick neutral" method which has been used for years and the only precautions which need to be taken to get best results is to lift the brushes from the surface of the commutator which are not being used and, sometimes, to use special brushes ground to a knife edge for the connections to the voltmeter.

An alternative method of more recent origin is one which measures the voltage across adjacent commutator bars midway between brush arms by means of probe electrodes and plots the results as a graph. Because the conductors are not uniformly distributed but grouped in slots, the graph is not a single line but rather a pattern of lines dependent on the number of coils per half-slot and whether the pitch is a whole number or a fraction. The mean position where the family of lines is distributed equally on either side of the zero datum corresponds to the correct position of the neutral, and the brush gear should be moved until the centre lines of the appropriate brushes in brush holders on positive and negative brush arms, spaced one pole pitch apart, lie symmetrically about this position (Fig. 3). The measurements are, of course, taken when the field current is interrupted as in the original method.

Interpole Strength

With the brush position properly adjusted we are now ready to carry out interpole strength tests. First, the machine should be run for a period until it has reached a steady temperature. When this has been reached, each brush is again

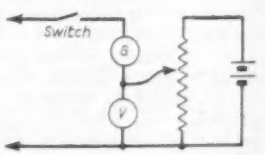


Fig. 5. The potentiometer method of determining brush contact drop avoids errors of contact resistance

checked to see that it is free in the box, that the tails are properly connected and do not foul the springs and, finally, that all of the spring positions are properly set. The normal operating temperature is usually reached after about six hours at full load and the intervening period can be used to check other motor characteristics not directly related to commutation.

There are two main methods. In the first, an examination of the current distribution in the brush/commutator interface provides a ready means of checking whether the interpole fields are of the correct strength. For ideal commutation, the current density over the whole interface should be uniform whereas, if the interpoles are too strong (over or accelerated commutation) the density will be greatest at the entering edge. Conversely, if they are too weak (under or retarded commutation), the density will be greatest at the leaving edge. The measurement is made by probes applied between the top and bottom edges of the brush and the results are plotted (Fig. 4). To avoid errors due to contact resistances, the potentiometer method shown in Fig. 5 is sometimes used.

Adjustment of the interpoles is made by altering the length of the air gap under the interpoles, sheet iron shims being usually provided at the base of the interpoles for the purpose.

In the second method a current booster is connected in the interpole circuit and the current is boosted until sparking commences at any one of the brushes on the machine. The booster current is then decreased until sparking ceases and the value of the current noted. Current is then diverted, or "bucked," from the interpoles until sparking again occurs and is then increased until it ceases. This current is also noted. The procedure is repeated at 50%, 100%, 150% and 200% full load, the speed and current being held constant during the tests at each value, and the results are plotted as shown in Fig. 6. The sparkless range or "black band" is that area between the two higher loaded points on the graph. For ideal interpole conditions, the two graphs lie symmetrical on both sides of the mean axis but satisfactory commutation will be obtained if neither cross the axis and one is on each side. If the machine is not a constant speed type, a range of readings is taken on both top and bottom speeds.

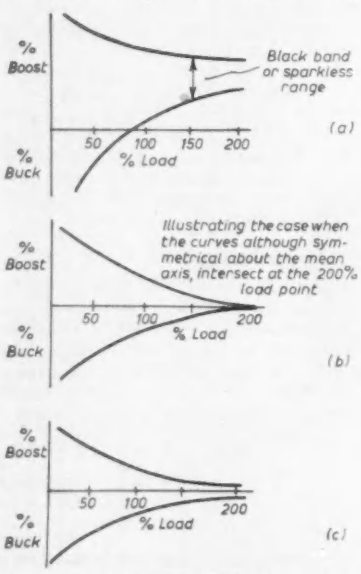


Fig. 6. Graphs illustrating the "black band" method of determining the correct interpole strength using a current booster

Auxiliary Commutating Poles

While the above tests cover most types of machines, there are special designs incorporating auxiliary commutating pole windings for particular applications as in the machine designed for widely varying speed ranges. In these, the commutation ranges for the various speeds will differ, being weaker at high speeds and therefore requiring more over-excitation. This is because the main field will be comparatively weak as compared with that due to armature reaction. In order to cope with the more distorted field pattern, the compole strength has to be increased. This is done by auxiliary compensating windings located behind the main interpole windings excited from a constant voltage supply.

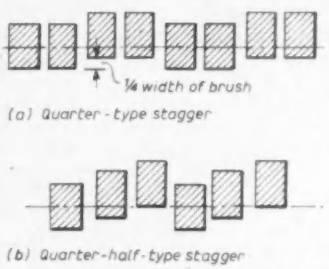


Fig. 7. Circumferential staggering of brushes

As speed variation is effected by altering the shunt field strength, compensating auxiliary interpole excitation can be adjusted simultaneously to give the required field strength and pattern. On test, commutation ranges are taken on the auxiliary interpoles for both top and bottom speeds just as on the main interpoles.

It is sometimes found that, although the commutation graphs are displaced symmetrically about the mean axis, they intersect at the 200% load point. This is obviously undesirable. One method of overcoming this is to stagger the brushes circumferentially (Fig. 7). In effect, this is the same as resistance commutation as, by so doing, the effective area of brush contact is reduced.

Short-circuit Tests

It may not always be possible to carry out full load tests, particularly on the larger types of motor. To determine whether commutation is satisfactory or not, it is then necessary to run the machine as a generator on short-circuit. The motor is driven at normal full speed with the armature short-circuited through

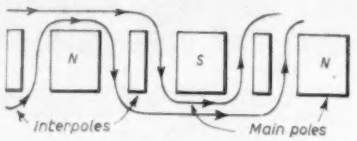


Fig. 8. Method of connecting stability test winding for short-circuit run as a generator

series, interpole and compensating windings and an ammeter. To maintain effective control over the short-circuit current, the machine must be run as a differential compound wound generator and, if a series winding is not fitted, it will be necessary to install a stability winding temporarily for testing purposes. This comprises two pieces of copper strap connected to form a differential series winding as shown in Fig. 8. It will be noticed that the straps are crossed so that the turns on the interpoles cancel each other out.

Commutation ranges and "black-band" graphs taken on short-circuit give a far worse impression of the strength of the interpole fields than is actually the case. This is because the shunt field strength is weak and is therefore more liable to distortion by armature reaction but, if properly adjusted, commutation under short-circuit conditions should still be satisfactory.

Commutation and the User

While it is every manufacturer's aim to achieve perfect commutation, in practice this rarely, if ever, happens. Departures from the ideal depend upon so many variables. In carrying out the numerous tests and checks during construction, chances of poor workmanship and faulty material are almost invariably eliminated. Those faults which are not detected during the production stages are of the type which only become apparent on full load tests when the machine has reached operating temperatures. By the time the machine leaves the manufacturer, these, too, will have been rectified.

Perhaps the most important factors affecting commutation in service are the correct setting and adjustment of the brush gear. In addition, there are the minor but equally important matters of correct type, fitting and staggering of the brushes. It follows that the machine will go into service in as good a condition as the manufacturer can achieve but, unless the ultimate user ensures that it is regularly and properly maintained, bad commutation will, in time, ensue.

As with all electrical equipment, the maintenance of clean operating conditions is an essential factor, more so with d.c. machines, perhaps, than with any other apparatus. It is good practice to mark the position of the brushes as set by the makers on installation, to keep the commutator clean and free from dust and to periodically examine and clean the brushes and brush boxes. Brush replacements should be of the grade recommended and fitted and, providing that these precautions are taken, long, trouble-free operation should be ensured.

STANDARDISATION PROGRESS

BRITISH STANDARDS . . . INTERNATIONAL RECOMMENDATIONS . . . INDUSTRY CODES

NEW colour coding for use on switchboards is laid down in the first revision of BS 158 since 1938. The new standard, BS 158:1961, *Switchgear Busbars—Main Connections and Small Wiring*, in particular changes the use of the colours green and black from that formerly prescribed in order to bring switchboards more into line with general wiring practice.

For busbars and main connections, red, yellow and blue are specified for phase conductors in three-phase systems, red and blue in 2 ph and 1 ph systems, red neutral in a.c. systems is always black, and connections to earth, green. Where phases are variable, as in connections to reversible motors, grey is to be used. The possible need to use white instead of yellow in extensions to existing installations is recognised.

For d.c. switchboards, the conventional red for the positive and blue for the negative are retained. Middle-wire connections are to be black, and connections to earth, green, with equalisers yellow. Where the polarity is variable, grey again becomes the specified colour.

In all systems, red is required to be at the top, to the left or furthest from the front and left or furthest away with vertical arrangements. The sequence runs RYB. In a.c. systems, neutral is required to occupy an outer position, but in d.c. three-wire systems, the middle position.

For small wiring, red, yellow and blue are used for phase connections to the primary circuit or to the secondary circuits of c.t's or v.t's. Black is for neutral connections and connections other than those just stated, green is for connections to earth, and grey for connections in d.c. circuits.

The new requirements will call for changes in standards for cables, and in the IEE Wiring Regulations. It will be noticed that the new colour coding does not involve the use of stripes.

An appendix to the standard suggests a code for identifying small wiring by letters and numbers related to function.

3456 Additions

FURTHER sections of BS 3456, the standard on testing and approval of domestic electrical appliances have been issued. A8 deals with immersion heaters, and replaces BS 1556. The lengthy section on performance is now relegated to an appendix, not part of the standard proper, as are notes on methods of fixing and dimensions of the standard head. A9, irons, and A10, steam irons, replace the parts of BS 1732. Finally, B4, hair dryers, replaces BS 3296, published only last December. In this case, as with the irons, the original standard is issued effectively unchanged.

Variable Resistors

ASSISTANCE to users of variable resistors complying with Defence Specifications is given in *Defence Guide DG-5120—Resistors, Variable, Wire-Wound and Composition*, recently published by HMSO, price 2s 6d.

The *Guide* notes that the relevant specifications recognise three humidity classes and two temperature classifications. Three types of variable resistors are covered, general purpose wire-wound (up to 120 W dissipation, ±10% tolerance); general purpose composition (low power dissipation up to 1½ W only, tolerance ±20%); and precision wire-wound (suitable for those applications where accurate linear, sine-cosine or other mathematical relationships are required, tolerance ±5%).

The precise implications of these tolerances and limits and of other factors relating to the various types of resistor are discussed in the *Guide*. A colour code is suggested for variable resistors, with an alternative letter marking, as follows: A or yellow, termination nearest movable contact with spindle set fully anti-clockwise as viewed from control end; B or red, the termination of the contact arm; C or green, the other end termination.

Also included in the *Guide* are notes on the suitability of variable resistors for use as potentiometers, and recommendations for power rating of log-law resistors.

I.C. ENGINES

THREE standards are published by BSI for general-purpose internal combustion engines. The present specification, BS 765: 1961, *Spark Ignition Engines*, is intended to assist all concerned with engine specification and performance to understand one another, and to have the same background assumptions in mind. In this respect, it introduces important changes as regards governing requirements, compared with its 1938 predecessor.

Two types of governing are now recognised, of which Class 1 is appropriate to the fine governing required in driving many electric generators. The limits for this class are a temporary change of 12% of nominal speed, on suddenly throwing off full load, and a permanent change of 6%; and a temporary change of 4% in speed when there is a change of load equivalent in magnitude to 20% of full load.

The standard also deals with fuel consumption, tests and declared fuel consumption, and with limits of cyclic irregularity when driving generating sets; also with angular deviation when driving alternators in parallel.

ANTI-STATIC RUBBER FLOORING

TWO types of flooring special in the electrical sense are now recognised, electrically conducting and anti-static. BS 3398:1961, *Anti-Static Rubber Flooring*, covers workmanship, composition, dimensions and physical properties of the latter type. This is applicable where electrical equipment is used, in which development of a fault could cause shock or fire risk.

The idea is that the anti-static rubber flooring should be sufficiently conducting to disperse static charges, but still have sufficient resistance to limit to a safe value any leakage current from the electrical installation or apparatus through the floor to earth.

The standard requires that the flooring shall contain not less than 35% by volume good quality new natural or synthetic rubber. Resistance measured between electrodes 4 sq in. area, placed 2 ft apart, has to be 2 megohm average with no result more than 5 megohm. In a wet test, the average must be not less than 50,000 ohm, with no single result less than 20,000 ohm.

A note on bonding included in the standard calls for bonding tape to be laid transversely when the floor is laid in the form of strips. When it is laid as tiles, two bonding strips are called for under each row of tiles, of copper or brass and at least 2 in. wide and 0·006 in. thick.

Enamelled Conductors

REVISED requirements for enamelled copper conductors are set out in BS 156, Part 1: 1961, dealing with oleo-resinous enamel, and BS 1844, Part 1: 1961, dealing with enamel with vinyl acetal base. Both standards have been brought into general similarity of form with the recently published BS 3160 and BS 3188, which deal, respectively, with wires covered with polyester enamel and with polyurethane enamel.

Personalities *in the industry*

Mr H. S. Davidson

Mr J. S. Hall

Mr J. V. Bigg

Dr D. F. Shannon

Mr P. G. Leven

Operations engineer (nuclear stations) at the CEGB headquarters since 1958, **Mr G. T. Shepherd,** B.SC.(ENG.), A.M.I.MECH.E., A.M.I.E.E., A.C.T.(BIRM.), is to be assistant Regional director, Western Division, in the South Western Region of the CEGB as from 1 Jan. next. He will succeed **Mr H. S. Davidson,** T.D., M.I.E.E., who is retiring early next year (*ESH, pages 48, 60). In that Division Mr Shepherd will be concerned with three new nuclear power stations—Berkeley, Hinkley Point and Oldbury. Prior to going to the Board's headquarters he was deputy station superintendent at Skelton Grange power station for five years. Educated at King Edward VI School, Birmingham, he served an apprenticeship with the GEC at Witton and then joined the City of Birmingham Electric Supply Dept. and subsequently held various positions in power stations and the grid control centre. Mr Davidson, who had been Divisional Controller of the South Western Division from 1957 until the reorganisation earlier this year, served as an apprentice with Drake and Gorham Ltd. and, after commissioned service in the first war, with the Carlisle Corporation. After a period at Wolverhampton he became a section engineer in the Central England area of the CEB in 1930, and three years later was promoted to senior assistant transmission engineer. Following further war service in North Africa and Italy, he returned to the C. England area as transmission engineer and continued in that capacity with Midlands Division from 1948 to 1957. Mr Davidson was chairman of the IEE South Midlands Centre in 1955-56.

Mr R. A. Erskine, M.A., M.I.E.E., MEM.A.I.E.E., managing director of Erskine, Heap and Co. Ltd., will be leaving in the second half of October for an extended tour of the Middle and Far East. He will be visiting existing and prospective customers in Iran, West and East Pakistan, India, Burma, Malaya and Ceylon, and will be away for about seven weeks.

Formerly a deputy director of the Production Group of the UKAEA, **Mr E. Nicholson,** F.C.A., has joined the Engineering Group of the General Electric Co. as financial controller.

In the AEI Turbo-Generator Division, **Mr J. S. Hall,** B.SC.TECH., A.M.I.MECH.E., has been designated divisional assistant chief mechanical engineer (turbines); **Mr J. V. Bigg,** M.A., A.M.I.MECH.E., A.M.I.MAR.E., becomes divisional assistant chief mechanical engineer (auxiliary apparatus) and chief engineer, General Engineering Dept.; **Dr D. M. Smith,** F.R.S., D.SC., M.I.MECH.E., F.R.AE.S., is now consulting mechanical engineer, and **Dr D. F. Shannon,** PH.D., M.I.MECH.E., is appointed chief engineer, mechanical experimental development and gearing. Mr Hall, who has been chief engineer of the Large Steam Turbine Dept. since 1959, after three years as chief engineer of the Steam Turbine Engineering Dept., joined the M-V Mechanical Drawing Office in 1927. He was appointed development engineer, Mechanical Engineering Dept., in 1950, and became assistant chief engineer, Steam Turbine Engineering Dept., in 1951, in which capacity he was concerned with the design of steam turbine plant of all capacities and field investigation of operating problems. Mr Bigg served a college apprenticeship with M-V, and after war service was an engineer in the Condenser and Gear Engineering Dept. He was appointed assistant chief engineer, Condenser Engineering Dept., in 1954, promoted to chief engineer, Condenser and Heat Exchange Engineering Dept. in 1956, and to chief engineer, General Engineering Dept. (which position he retains) in 1960. Dr Smith graduated at Glasgow University before joining M-V, and was associated with that company's gas turbine development work from its inception, being chief engineer, Gas Turbine Engineering Dept., when that department was constituted in 1944. Twelve years later he was appointed chief engineer, Mechanical Engineering Development. Dr Shannon, who has been chief engineer, Gear Engineering Dept., from September, 1957, joined M-V in 1944 as assistant chief engineer, Gas Turbine Dept., after a period with RAE, at Farnborough. He transferred to the Gear Engineering Dept. in 1956.

On medical advice **Sir Edward Lewis,** chairman of the Decca group of companies, has resigned from the Committee on Consumer Protection. The President of the Board of Trade has decided not to make a further appointment to the Committee at this advanced stage of its proceedings—its report is expected early next year.

Formerly sales manager of Ascot Lamps, **Mr P. G. Leven** has joined Edmundsons Electrical Wholesalers Ltd. as field sales manager. He is operating from 240-250 Ferndale Rd, S.W.9.

Dr D. H. Sharp has been appointed director (technical) of the Federation of British Industries as from 1 Nov., in succession to **Major-Gen A. J. H. Dove,** who is relinquishing the post in order to devote more time to voluntary work. At present Dr Sharp is assistant to one of the managing directors of Fison Ltd.

Chief engineer of the Gas Turbine Department of AEI (Manchester) Ltd. since 1959, **Mr F. R. Harris,** B.SC.(ENG.), A.M.I.MECH.E., has been appointed chief engineer, Advance Turbine Development,

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**Denotes revision to the "Electricity Supply Handbook, 1961."*

and chief engineer, Gas Turbine Engineering Dept. **Mr J. C. London,** B.SC., M.I.MECH.E., A.M.I.C.E., formerly assistant chief engineer (development), Large Steam Turbine Dept., is promoted to chief engineer, large steam turbines, and **Mr A. A. Garson,** M.A.(CANTAB.), A.M.I.MECH.E., previously assistant to the chief engineer, Steam Turbine Engineering Dept., Rugby, becomes chief engineer, medium steam turbines. Mr Harris started with M-V at Trafford Pk as a college apprentice in 1938 and, after war service, joined the Gas Turbine Engineering Dept. as a design engineer. After a period as engineer-in-charge of the Order Section he became assistant chief engineer of that department in October, 1956, and chief engineer in 1958. Mr London also started with M-V Trafford Pk, after sea-going experience. He later specialised in steam turbine design and special projects. After a period with the Mechanical Engineering Dept. he became development engineer, Steam Turbine Engineering Dept., in 1951, and eight years later was promoted to assistant chief engineer (development), Large Steam Turbine Dept. Mr Garson served a student apprenticeship with BTH, Rugby, and after naval service became a design engineer in the Turbine Engineering Dept. in 1946. Four years later he joined the Admiralty Research Dept. at Yarrow and the following year assumed the post which he has just relinquished.

Retiring after over 38 years' service at the Fraser and Chalmers Engineering works, Erith, **Mr H. G. Hague,** M.INST.F., A.M.E.M.E., coal consultant to the General Electric Co. Ltd., was recently presented with an inscribed gold watch from his colleagues and a cheque from the company. The presentation was made by Dr K. J. Wootton. Mr Hague was manager of the Coal Preparation Department from 1940 to 1948, when he became consultant, and has travelled widely in this country and abroad selling and commissioning pulverised fuel and coal washery plant.

At present with the UK Atomic Energy Authority at Risley, **Mr J. D. Glanville** is joining Richardsons, Westgarth and Co. Ltd. as a director, and will assume the responsibilities of group production director at the beginning of 1962. **Mr W. R. Jones,** at present managing director of George Clark (Sunderland) Ltd., becomes group personnel director, and **Mr H. Watson-Jones,** M.ENG., M.I.E.E., M.I.MECH.E., M.I.MIN.E., at present managing director of Richardsons, Westgarth (Hartlepool) Ltd., becomes group commercial director. Both remain directors of the parent company. **Rear-Admiral J. G. C. Given** has resigned from the board and will cease to be managing director of the Marine Division of the group on 30 Sept. when he leaves the service of the company. From the same date the subsidiary companies (with the exception of Humber Graving Dock and Engineering Co. Ltd.) will become production units with centralisation of the main functions at group headquarters, Wallsend, and will no longer come under the direction of individual managing directors.

Production manager, Power Cables (Woolwich) in the AEI Cable Division since last December, **Mr D. J. Fee,** WH.SCH., A.C.G.I., D.I.C., M.I.E.E., has been appointed departmental manufacturing manager, Woolwich and Gravesend works (power and supertension cable). His successor at Woolwich, with the title of production manager (power and supertension cable), is **Mr R. Ludwick,** who has been production superintendent there since 1959. Mr Fee started as a technical assistant in Henley's research laboratory in 1930, but four years later joined the M-O Valve Co. In 1938 he became an assistant engineer with Siemens, at Woolwich, engaged in research and development on telecommunication cables, etc. During the war he served at the War Office and the Scottish HQ as a staff officer, and on the HQ lines of communication of the British Liberation Army. Rejoining Siemens as head of the laboratory he was concerned with the development of telecommunications and accessories. He became chief development engineer, plant and process, Cable and Ebonite factories in 1953, and manufacturing manager, power cable and lines, two years later.

Viscount Caldecott, D.S.C., M.I.MECH.E., M.I.E.E., A.F.R.AE.S., has been appointed deputy managing director and chief executive (guided weapons) of British Aircraft Corporation Ltd., as from 1 Oct.

Sir William McFadzean, chairman and managing director of British Insulated Callender's Cables Ltd., as chairman of the Export Council for Europe is now leading a mission to Yugoslavia to conclude the Council's fact-finding surveys in 19 European countries this year. He is due to return next week-end.

Mr J. B. Blakeborough has been appointed to the board of Mirrlees (Engineers) Ltd. as executive director, and will be located at the Hillington works.

Mr H. Weston Howard, O.B.E., has been appointed chairman, and **Mr A. C. Ball** managing director of Hayward Tyler and Co. Ltd., a subsidiary of Stone-Platt Industries Ltd.

Director of overseas operations, English Electric Co. Ltd., **Mr Leonard H. Short,** M.C., has been elected chairman of the Export Panel of BEAMA. He has been vice-chairman of the Panel for the past two years and succeeds **Mr E. V. Small,** consultant to AEI Export Ltd., who was the previous chairman. The new vice-chairman is **Mr H. P. Martin,** sales director of C. A. Parsons and Co. Ltd.

Mr R. I. Douglas has been appointed export sales manager of Permali Ltd. He will continue to be responsible for the sale of track insulation, etc., to British Railways.

Sales manager to the Thermostat Division of R. B. Pullin and Co. Ltd., **Mr R. W. Jelbart** has now been appointed sales manager to the Traffic Barrier Division of the company in addition.

Mr F. T. Jones, A.M.I.PROD.E., has been appointed a director, and **Mr J. A. Grace** commercial director, of Microcell Ltd.

Previously with EMI Electronics and Marconi Instruments Ltd., engaged on oscilloscope development, **Mr L. D. Kreps** has joined Telequipment Ltd. as chief development engineer.

Aerostyle Ltd. have appointed three additional outside sales representatives: **Mr F. T. Houlan,** who will be based in London, will cover East London, Essex and the east coast; **Mr A. G. Synnuck,** responsible for E.C. London, north Middlesex, Beds and Herts, and **Mr J. Fulton,** for N.W. London, West Middlesex, Bucks and Oxfordshire.

Dr D. F. Denny, PH.D., B.SC.(ENG), A.M.I.MECH.E., has been appointed chief engineer of Ronald Trist and Co. Ltd.

OBITUARY

We offer our sincere condolences to Sir John Pickles, chairman of the South of Scotland Electricity Board, on the death of his wife, **Lady Pickles,** on 11 Sept.

Mr E. R. Clarke, formerly a director of G. A. Harvey and Co. (London) Ltd., died on 17 September, aged 87.

Supply Scholarships

SCHOOL-LEAVERS have received 61 scholarships from the electricity supply industry in its effort to meet its need for university-trained engineers and scientists. The scholarships pay all tuition and other fees plus a maintenance grant of £330/year at most universities (more at Cambridge, London and Oxford). These rates are above the level for most local authority scholarships and are not tied to a "means test" of parents' income. Thirty-six scholarships are granted jointly by the 12 area boards, the rest by the CEGB, all the area board scholarships being in electrical engineering.

The scheme has been operating for three years, and in that time more than 150 scholarships have been awarded. Details are circulated widely to grammar schools and public schools by the Electricity Council.

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to facilitate tasks; all make instructive reading.

Indicator Lamps

THE use of indicator lamps to show the state of operation of a circuit or a fault condition will be dependent upon the reliability and life of the lamp. This was mentioned in a number of instances in the ELECTRICAL TIMES earlier this year. A great deal can be done by choosing the right type of lamp and the manner in which it is used in the circuit.

Some years ago I decided to fit lamps in the excitation circuit of six steel-tank mercury-arc rectifiers operating in pairs in three substations. The ammeters, being located behind grilles, were unreadable at any distance.

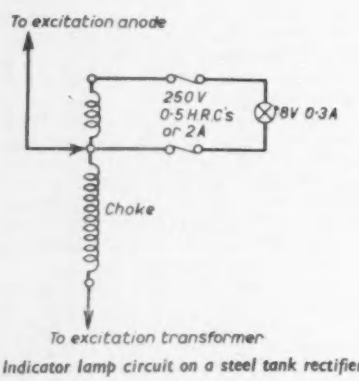
Six good quality m.e.s. moulded lamp-holders were obtained from a reputable maker and these were used to accommodate 8 V, 0·3 A bulbs, obtained from a multiple store, behind red "Perspex" lenses. These were connected, as shown in the diagram, across a tapping giving 4½ V to 5 V and, since the indicators were at a potential above earth at full rectifier volts, small h.r.c. fuses were inserted to give protection.

It is now more than ten years since they were installed and the rectifiers have been on load almost continuously for 15 hr/day to 19 hr/day throughout the period, but the original lamps are still intact and are visible over an arc of 180° for distances up to 60 ft. This has been despite slight but continuous vibration, and I estimate that the life is now reaching close on 60,000 hr. How much longer they would run is problematical, since two of the stations have been shut down as redundant and the future of the others is in the balance. Those in service are still going strong.

This shows that long indicator lamp life can be achieved if only the lamps are sufficiently under-run without lowering the illumination below reasonable limits. Mains surges are inimical to long life, both with lamp bulbs and semi-conductor devices. A generous margin should always be allowed. In this case operation has been on 60% of the rated volts, but it is important to remember that the long life to be expected by under-running could be abruptly terminated by a surge through, for example, a lightning "strike" on the line.

In regard to the use of m.e.s. bulbs, those designed for cycle dynamos and rated at 8 V, 0·3 A or 6 V, 0·5/0·3 A are more suitable than the 3·5 V or 2·5 V pocket torch bulbs. Under-run bulbs of the higher ratings designed for 6 V or 12 V motor-car systems will also last indefinitely under similar conditions.

Where it may be considered that the cost of miniature lampholders and associated indicator housings is excessive for a particular location, or that the visibility is restricted, the use of standard s.b.c. holders and low-voltage bulbs is to be preferred to mains voltage 15 W or neon types, both as regards reliability and long life.—*A. W. Tull.*



Indicator lamp circuit on a steel tank rectifier

Home-made Loop-tester

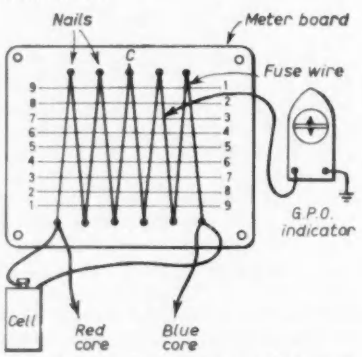
THE location of a fault on an underground cable, where one core is sound and the faulty core is well and truly earthed can, of course, be determined by a conventional loop-testing equipment. It often happens, however, that such a fault occurs at a time and place where the testing equipment is not available and, of course, all such faults need urgent attention.

Some years ago such a fault occurred on a three-core h.t. cable between two substations about a mile and a half apart. The ordnance route map of the cable run was available, but the only official loop-testing equipment was many miles away and could not be got to the scene for about six hours. Faced with the emergency, I and another colleague fashioned a loop-testing device from a meter board and nails with fuse wire as shown in the diagram, lines between the two rows of nails being scribed to serve as divisions. The indicator was a sensitive galvanometer borrowed from the local Post Office Telephone Department and the source of current a 2 V battery from the company's stores. With this home-made device a first measurement was made from one substation, and the distance paced out along the cable route. A second measurement was then taken from the opposite end and this too was paced out. The two marks on the kerbside were only about 3 ft apart, which was sufficient encouragement to open up the ground and, as good luck would have it, the fault was found within a few inches of the first mark.

When the official testing equipment eventually arrived, the jointers had already repaired the cable and were filling in the hole. The same testing apparatus was subsequently used on two other faults and located the position within a reasonable distance, but not quite so accurately as on the first occasion. But it served to show that a home-made hook-up can achieve results which are quite as reliable as that of the more sophisticated equipment from an instrument maker.—*Ion.*

Neutral Earth Fault

VISITING a friend I was greeted with the news that his refrigerator was playing up, making heavy weather of starting each time the motor "cut-in." The refrigerator engineer had been and had told him that he would need a replacement sealed unit. This, of course, cheered him up immensely! During the evening I noticed that the lights flickered momentarily each time another was switched on. Wondering if this could have anything to do with the refrigerator trouble I asked to examine the fusebox. Here, as I anticipated, I found that the refrigerator was on the same circuit as the lighting; moreover, the neutral fuse had blown and there was an intermittent earth on the neutral behind the board. Removing the fault and replacing the neutral fuse by a solid link cured the trouble, but I would have liked to have seen the engineer's face when he turned up later with the unwanted replacement unit.—*J.S.B.*



An h.t. cable fault was located with this home-made fault finder

Synchronous condenser substation

150 kV AND 220 kV INTERCONNECTION AT ZURICH

THE increasing demand for electricity in Zürich and the necessity to improve reliability of supply have required considerable improvements to the system and these are scheduled for completion in about 1964. Most of the supply was, until a few years ago, brought to the city by three 150 kV lines. To avoid further interference with the countryside, the Municipal Electric Supply Undertaking decided to alter existing lines and substations for the next higher Swiss transmission voltage of 220 kV.

The new substation is at Fällanden and a description of it was included in *Bulletin Oerlikon* No. 344.

The Fällanden substation is sited at the edge of the city and, in addition to connecting the city's 150 kV system with the 220 kV grid, it is also at one end of a 50 kV line suitable for uprating to 150 kV. It can also be connected, with the aid of the 220 kV system, to the 380 kV grid, which is now under construction, through a transformer station at Breite.

The Fällanden substation is planned to maintain full transmission capacity if one of the supply lines should be out of commission through a fault. Eventually, three 220 kV feeders will be available when a further 220/150 kV substation is built. Because the substation will interconnect the city's 150 kV system with the 220 kV grid, Fällanden was also considered the most suitable site for reactive power compensation. Accordingly, two 25 MVAr synchronous condensers have been installed. Their main function will be to supply reactive power for the consumer system to relieve the 220 kV system grid during periods of heavy load and to compensate both the 220 kV and 150 kV underground cable systems during periods of light loading, particularly at week-ends. They will also help to maintain stability of the system under fault conditions.

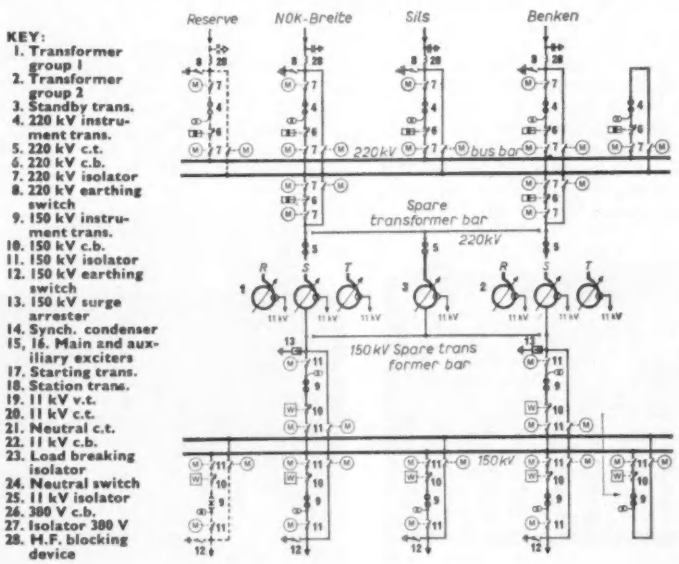
The substation is required to provide standby facilities for outage of: one 150 kV line section, one 150 kV transformer section, one 220 kV transformer section, one 220 kV line section or one transformer unit. As shown in the diagram, these conditions are met by providing auxiliary busbar systems at 150 kV and 220 kV, auxiliary sections at 150 kV and 220 kV and by a single-phase standby transformer.

Synchronous Condensers

The two synchronous condensers are each rated 25 MVAr at zero power factor, leading or lagging. They are designed for a system voltage of 11 kV ±10% at 50 c/s, 1,000 r.p.m. Each set includes main and auxiliary exciters and a permanent magnet auxiliary generator. They are designed for self-starting by auto-transformer. Low loss material has been used for the stator laminations and the stator winding is short-pitched, preformed pattern, with two conductors per slot.

The synchronous condensers have a transient reactance of 0·27 p.u., much lower than an equivalent static unit and, therefore, with more rapid response to changes in supply voltage. An automatic voltage regulator also assists rapid correction of voltage change. The machines are coupled to tertiary windings on the 220/150 kV system intercoupling transformers.

The condensers have a voltage regulator, but overriding control is provided by a current regulator and a reactive power regulator. Under steady state conditions reactive power is drawn from the 220 kV line to partially compensate for its capacitance.



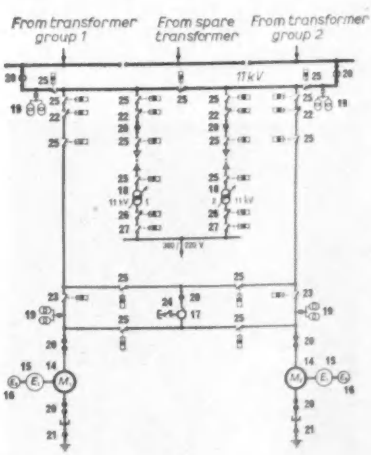


Fig. 1. Single line diagram of interconnections at Fallanden. Busbar layout is indicated, left, and above are the synchronous condenser connections to the transformer tertiary winding busbars

new products and appliances

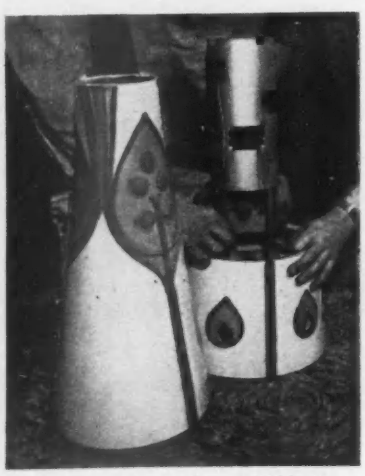
Overhead line tester

DEVELOPED in conjunction with the British Railways particularly for use on the 25 kV and 6·25 kV sections of the Eastern Region, a new overhead line testing device gives instantaneous and clear indication of the state of the line and full protection to the user.

The tester is in four sections, each of polyester bonded glass fibre, which can be assembled into a light rod, the upper section of which provides the contact with the overhead line and can have a hook for hanging if desired. The second section incorporates a neon tube indicator, similar to that used in the "Westminster" pressure detectors, with a daylight shield. A 40 kV test capacitor in series with the detector on the live side and a flexible earthing cable, with magnetic attachment for the running rail, are added safety measures. *Westminster Engineering Co. Ltd., Victoria Rd, London N.W.10.*

Artistically styled fire

ARTISTICALLY styled and unusually shaped is a convector heater with an outer casing constructed of ceramics. Shaped in the form of a cooling tower, this heater has a ¾ kW Belling spiral element. The base of the "tower" is perforated at intervals by vents, and air, after passing over the element, is funnelled out in a column at the top. The makers, Ceramic Consultants, say that this heater is designed to provide background heating rather than be the main source of heat. These heaters cost approximately £20 each. *Ceramic Consultants Ltd., Thayer St, W.1.*



This convector heater has a ¾ kW loading

New range of commercial fittings

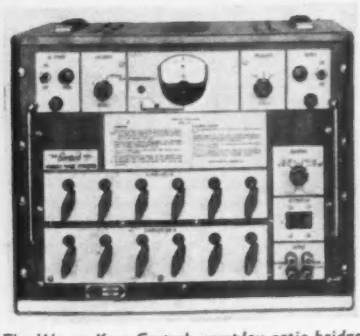
A NEW range of commercial lighting fittings, "Louvrelens," has been announced by Holophane this week. Basically they consist of a concave prismatic glass lens mounted in the circular rim of a metal box for recessing into ceilings or soffit. There are two sizes of fittings in the range, the larger of these having a 12 in. dia refractor and recessed depth 13¼ in. This model, LV 462, is suitable for 200 W to 300 W GLS lamps. The smaller model, LV 460, is suitable for 100 W to 150 W lamps and has a 6 in. dia refractor. Recessing depth for this unit is 9⅜ in. In each model the box is designed for top cable entry, with bridge pieces for the lampholder assembly. *Holophane Ltd., Elverton St, S.W.1.*

Ratio bridges

TWO new complex ratio bridges, designed and manufactured by Gertsch Products Inc., of the USA, are now available for laboratory use in this country. Each instrument is designed for the precise measurement of in-phase and quadrature voltage ratios of three and four terminal networks and they also measure the phase shift angle between 0 and 1° (or between 0 and 10°) and the tangent of the phase shift angle.

With six-place resolution and an accuracy of 0·001%, the CRB-1B operates over the 30 c/s to 1,000 c/s frequency range and the CRB-2B over the 50 c/s to 3,000 c/s range.

Both instruments have a power input rating of 100 W at 115 V to 230 V, 50 c/s to 60 c/s, are provided with current and voltage terminals to eliminate errors through IR drops in connecting leads and the read-out of transformation ratios is from digital switches. Cabinet dimensions are 19½ in. wide by 16¼ in. high by 13 in. deep. *Wayne Kerr Laboratories Ltd., 44 Coombe Rd, Malden, Surrey.*



The Wayne Kerr Gertsch complex ratio bridge

Motorists' aid

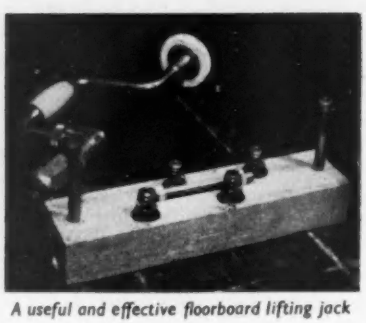
OF potential use to motorists when driving at night is an illuminated magnifying glass. Combining a powerful glass with a battery lamp, it can also be used in photography and by philatelists. It uses a 2 V lamp, powered by a pencil battery. The lamp is turned on simply by rotating a knurled screw in the base of the handle which houses the cell. Finished in chrome, the magnifying glass costs 14s 6d and is not liable to tax. *L. S. Mayer (London) Ltd., Essex Rd, N.1.*

Razor socket is universal

THE first shuttered universal razor socket from Loblite has been introduced this week. It is claimed to be the first unit made which is suitable for British, American and continental 5 A plugs used on electric razors. There are four units in the range, three are semi-flush fittings and the other surface mounting. Fittings are available in white and brown and manufacturers state that they are not suitable for fixing in bathrooms. Singly boxed in cartons of one dozen, prices vary from 8s 9d to 10s 6d each. *Loblite Ltd, Third Ave, Team Valley Estate, Gateshead.*

Floorboard jack

A JACK for lifting floorboards, prior to cutting, in house electrical installations is a tool which enables the electrician to avoid unnecessary damage and shortens the task. The "Imalrite" floorboard jack is a simple, but effective, design which needs only a carpenter's brace as the operating tool. From the photograph, below, it can be seen that the jack comprises a stout timber bridge-piece with four specially designed holding screws of high-tensile steel with retaining springs. These are used to grip the floorboard, after which the whole is elevated by the high-tensile steel jack screws at each end. A hexagonal key, housed in spring clips when not in use, provides the connection between brace and screws. The weight is under 2½ lb and it will attach to and lift a board in under 1½ min. The length of the jack is 11 in. which is sufficient to span 9 in. floorboards but should an occasional 13 in. board be found, this can be raised by placing two jacks side by side and using the outer jacking screws. Price is 57s 6d *G. G. Gundry-White, 5 Elms Rd, London, S.W.4.*



A useful and effective floorboard lifting jack

Additions to wiring accessory range

TWO new wiring accessories have been added to the AEI Cable Division range of "Windsor" fittings. First of these is a combined socket-outlet/fused spur unit. It comprises a 13 A three-pin shuttered socket-outlet to BS 1363 and a 13 A switched fused spur unit on a moulded front plate. This is said to be suitable for fixing to a two-gang box of BS 1299 type. The unit is available in brown or white, either with or without pilot lights.

Second addition to the range is a series of 20 A switches, designed primarily for water heater control, but they are also claimed to be suitable for floor heating control and similar applications. They are available for surface or flush mounting and can be supplied with pilot lights if required. Flush mounted switches can be either single- or twin-gang and are suitable for fitting to BS 1299 boxes. Cast iron boxes to which flush switches can be fixed to form surface mounting units can also be supplied. *AEI Cable Divn, 145 Charing Cross Rd, W.C.2.*

Lamp has long life

CLAIMED to have an extra long life and superior performance, the Golden Crompton Lamp, which is being introduced for the winter season, is designed to operate even where voltage variations may be experienced. Lamps, which are individually time delay tested, are available in 40 W, 60 W, and 100 W ratings and retail at 2s 6d. Lamps are sold in sealed packs as the manufacturers say they do not need testing by retailers. *Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2.*

Fire has curved elements

AN unusual feature of the "Coalorama" fire, which has been announced recently, is the use of curved elements on a curved reflector. This is said to assist in spreading heat over nearly 180° instead of the more usual hot spot directly in front of the fire. There are four 500 W silica encased elements controlled in pairs by two switches and when the fire is switched to half heat, one element in each pair becomes radiant. Another feature is the provision of a glass fibre coal effect with a flicker mechanism—operated by an electro magnet—which can be quickened or slowed as required. Finished in hammered bronze with an anodised aluminium reflector. "Coalorama" is 23¼ in. high by 10½ in. deep by 20½ in. wide. It sells at 18 gn, including purchase tax and surcharge. *Thermair Domestic Appliances Ltd., Izons La, West Bromwich.*

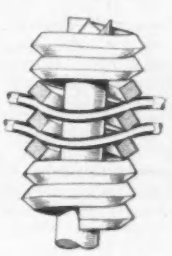
Left: Curved reflector and silica elements are features of this 2 kW heater

Cartridge-assisted tools

IN our description of the new design of Hilti DX100L cartridge-assisted fixing tool (page 347, 7 Sept.), we stated that the improvements were related to weaknesses disclosed by the earlier model in service. We now understand that this is not the case. It was not intended to imply that the earlier design was other than entirely satisfactory and any such suggestion which our note may have conveyed is regretted. The DX100L (not DX1001 as was incorrectly stated), which is used to drive home a pin or stud, has been redesigned to eliminate the need for frequent servicing; the new model will need routine cleaning only at intervals of 10,000 operations. Its head has been redesigned so that the full force of the hammer blow is passed directly through the shank and the baseplate has been redesigned so that it needs checking for tightness only at the routine servicing intervals. An easy-to-grip red sleeve is provided for the tool, the price of which remains unchanged.

Sound level indicator

A TRANSISTORISED sound level indicator of extremely compact design and weighing only 14 oz with batteries, the Dawe Type 1408D has a sound level range of 64 dB to 110 dB above the standard sound pressure of 0·0002 dyne/sq cm. The microphone is a Rochelle salt crystal diaphragm type, designed to operate over a temperature range of 0°C to 45°C, feeding into a special high input impedance circuit. The meter is calibrated from −6 dB to +10 dB and is calibrated against a substandard which is periodically checked by the NPL. The battery is a Type PP4 9 V dry cell and the performance of the indicator is virtually unaffected by a 30% reduction in battery voltage. The two-stage amplifier sections incorporate printed circuits with end-mounted components, and the whole is enclosed in a case 6 in. by 3 in. by 2¼ in. *Dawe Instruments Ltd., Brentford, Middx.*



Right: Novel connector terminal for plastic-covered wire. Centre: Sketch shows how contact is effected through insulation

Miniature lamps

APPROACHING Christmas turns thoughts to decorative display lighting. Among the new lamps in the Piselli range are two-pin miniature bulbs and weatherproof outdoor lighting sets. The two-pin bulbs are said to have long life and incorporate a secondary circuit so that if one lamp fails the rest remain alight. *Insley (London) Ltd., Insley Hse, Windmill St, W.1.*

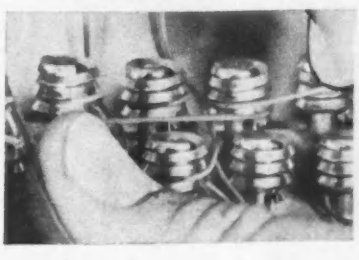
Storage heater for the home

SHORTLY after the recent Customs and Excise ruling regarding liability of thermal block storage heaters to purchase tax, Ekco have announced a domestic model in their "Thermostor" range. The unit is loaded to a maximum of 2·5 kW and has a thermal cut-out link surrounding the outer casing which disconnects mains supply to the appliance if overheating occurs through prolonged charging. The heater is styled for the home and finished in two tone enamel. Classified type TDM25, it is 31 in. high and 22 in. wide with a depth of 12 in. The heater sells at £21 14s 11d including purchase tax and surcharge. Also in the range are three industrial storage heaters with loading between 1½ kW and 3 kW which are finished in hammertone bronze. Price varies between £18 7s 7d and £27 11 4d. These prices also include purchase tax and surcharge. *Ekco Heating and Electrical Ltd, 41-47 Old St, E.C.1.*

Novel termination

ONE may always expect something unusual, simple and effective to originate from the Bell Telephone Laboratories and the latest quick-connecting and disconnecting terminal posts are no exception. The photograph below shows the terminal posts, which are detailed in the sketch alongside. It comprises a coil spring of rectangular section wire with the edges meeting at each turn, the whole being supported on, and in electrical contact with, the central post. The mere action of pulling a thin insulated wire in between adjacent turns of the coil serves to pierce the insulation and make effective contact with the conductor. The spring is of tin-plated phosphor bronze wire, about $\frac{1}{16}$ in. square, and it is wound into a coil of about $\frac{1}{4}$ in. dia.

These terminal posts are in production by the Western Electric Co. in the USA for local Bell Telephone companies, and it is said that they are perfectly satisfactory. So far they do not appear to be available here. *Bell Telephone Laboratories, 463 West St, New York 14.*

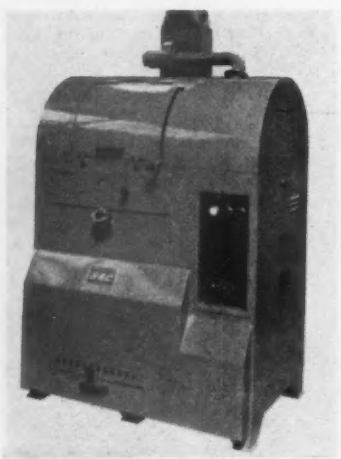


Ultrasonic thickness gauge

AN ultrasonic thickness gauge which requires access to only one side of the material, yet measures thicknesses from 0·09 in. to 5 in. with an accuracy of 3% to 5%, is a useful device for the engineer engaged on non-destructive testing. It incorporates an all-transistorised oscillator, generating sound waves at 2 Mc/s to 4 Mc/s, and the resonant frequencies are recognised by increases in the audio signal received in headphones. Both flat and curved transducers for transmitting the ultrasonic waves to the material are available and the thickness can be read on the clear, open scale. Weight of the instrument, Type 1103, is 4¼ lb including batteries, transducer, cable, harness and headphones. The thickness gauge can also be used to detect flaws in thick metal sections. *Dawe Instruments Ltd., Brentford, Middx.*

Money to burn!

FAR from wanting to burn treasury notes, most people want to save them, but for those that do, GEC have introduced a destructor which is said to burn money and similar material with ease. The destructor has a capacity of 4½ cu ft and is claimed to be able to destroy 65,000 treasury notes in about three hours. This is the equivalent of 200,000 notes a day. All means of access can be securely locked during operation and the load can be inspected through an armour plated spy-hole. The destructor is loaded to 6 kW and has spiral wire elements. A power driven rocker separates the notes and breaks up ash ensuring complete destruction. The unit is controlled by two time switches, one to cut off supply when ignition has started and the other to operate rockers. Indicator lights show when mains motor and heaters are on. The unit is intended mainly for banks and business houses. Prices of these units vary as they are custom built. *GEC Ltd., Magnet Hse, Kingsway, W.C.2.*



For those with money to burn, a destructor unit by GEC. It is loaded to 6 kW and may be securely locked

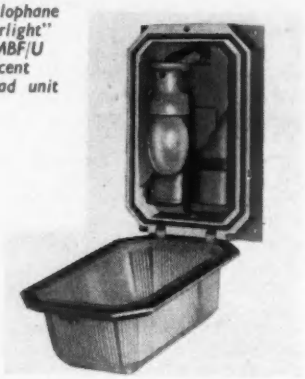
Custom-built heaters

A RANGE of withdrawable immersion heaters which are built to customers' requirements has been introduced this week. Magnesium oxide has been used as a former to carry resistance wire in place of ceramics and the element in a finned sheath is fitted into a pocket. The element is said to make close contact with the pocket and so gives greater heat transfer efficiency. Manufacturers claim that this type of element is virtually unbreakable and, this being so, maintenance costs are reduced. These immersion heaters are available with thermostatic control. These units can be made to any required loading. *Elton (London) Ltd., Strathmore Rd, Croydon.*

Pencil sharpener works off mains

A NEW mains operated pencil sharpener, "Tombow," has recently been announced by Business Aids. Operation is simply by inserting a pencil in the machine which is claimed to give a point in less than 2 sec. The cast iron casing, finished in grey and black, is mounted on rubber feet. A clear plastics shavings container is easily removable and the unit weighs 5¼ lb. Loaded to 80 W, "Tombow" is supplied with 5 ft of cable and is suitable for 220/250 V supply. It costs 10 gns. *Business Aids Ltd., 185 Goswell Rd, E.C.1.*

The Holophane "Widerlight" 50 W MBF/U fluorescent bulkhead unit



Fluorescent bulkhead unit

A NEW bulkhead unit in the Holophane range, the "Widerlight," has been designed to accommodate the 50 W MBF/U mercury fluorescent lamp. A heat deflecting barrier plate separates the lamp from the elongated choke and capacitor, the arrangement making a compact and neat fitting for locations where the ambient temperatures do not exceed 25°C on ceilings or 35°C on walls. The weight is 8 lb.

The standard finish is light grey and, for surface mounting, top and bottom entries, tapped for ¾ in. conduit, are supplied. *Holophane Ltd., Elverton St, London S.W.1.*

TRADE PUBLICATIONS

ALBRIGHT AND WILSON.—72-page profusely illustrated booklet with monochrome and colour plates gives an account of the group's activities in the field of chemistry. Albright and Wilson Ltd., 1 Knightsbridge Green, S.W.1.

ALLEN AND POPE.—Descriptive leaflets and price list of "Aristocrat" lighting fittings and wall brackets. Allen and Pope Ltd., Sandringham Rd, Dalston, E.8.

AUSTINLITE.—Pictorial booklet detailing rotary switches by Austinlite Ltd., Malvern Link, Worcs.

BADER.—Illustrated brochure describing activities of company in field of incandescent semiconductor machinery. Bader Machinery Co. Ltd., Walton-on-Thames.

E.E.—Two illustrated booklets, one entitled "Developments in 50-cycle Traction" and the other "Traction." English Electric, E.E. Hse, Strand, W.C.2.

EKCO-ENSIGN.—Specification leaflets of season's lighting fittings. Ekco-Ensign Electric Ltd., 45 Essex St, W.C.2.

EKCO.—New heating trade catalogue for 1961-2 with full range of equipment by Ekco Heating and Electrical Ltd., Southend.

ERICSSON.—Data sheet relating to Ericsson Type 51 relay. Ericsson Telephones Ltd., Beeston, Nottingham.

G.E.C.—New catalogue of products from Installation Equipment Group replaces loose-leaf price list. New prices from 18 Sept. G.E.C. Installation Equipment Group, Four Ashes, Wolverhampton.

G.E.C.—Pamphlet detailing developments of motor control centres. G.E.C. Ltd., Switchgear Divn., Birmingham 6.

HOLOPHANE.—Publication 6108 describing "Louvrelens" system of lighting for commercial use. Holophane Ltd., Elverton St, S.W.1.

KENT.—Pamphlet describing oxygen analysis equipment. Geo. Kent Ltd., Luton, Beds.

LANCASHIRE DYNAMO.—Leaflet giving specifications of the "Crypto-D" totally enclosed fan-cooled motor. Lancashire Dynamo and Crypto Ltd., Acton La, Willesden, N.W.10.

LONDEX.—Four-page leaflet giving details of range of annunciator alarm units. Londex Ltd., Anerley Rd, S.E.20.

LLOYD INSTRUMENTS.—Leaflet describing programme counter controllers by Lloyd Instruments Ltd., 6 Furrow La, Homerton High St, E.9.

METRIX.—Leaflet describing Lavoie "Robotester," a programmed measuring instrument. Metrix Instruments Ltd., 54 Victoria Rd, Surbiton.

M.P.L.—New leaflet, V6B, "A complete vitreous enamelling service," by Metal Porcelains Ltd., Cornwall Rd, Smethwick 40.

MULLARD.—Brochure illustrated with diagrams and giving details of the Magnadur Permanent Magnets. Mullard Ltd., Component Divn., Mullard Hse, Torrington Pl, W.C.1.

NARDA.—Catalogue of microwave and u.h.f. electronic test equipment available from Aveley Electric Ltd., Ayron Rd, South Ockendon, Essex.

OPTOSHIELD.—Leaflets giving details of spark resistant tools. Optoshield Ltd., 146 Clerkenwell Rd, E.C.1.

PHOTOELECTRONICS.—New leaflet describes photoelectronic controls for industrial uses. Photoelectronics (M.O.M.) Ltd., Oldfields Rd, Sutton, Surrey.

POLYPENCO.—Three new brochures dealing with "Fluorosint," "Nylatron G.S." and "Nylaflow" flexible pressure hose. Polypenco Ltd., Tewin Rd, Welwyn Garden City.

News of the Week

First Moves on Eyesores

E. Midlands and N. Western boards approach local authorities

TWO area boards so far have made a move towards the amelioration of eyesores such as overhead lines in picturesque villages and badly sited transformers, following Electricity Council discussions on the subject which began last May. In each case the boards are interested in co-operating with local authorities on a cost-sharing basis. East Midlands EB already have one such scheme planned in conjunction with Northampton CC, which provides for the undergrounding of six spans of line in Stanwick village and is now awaiting Ministry of Housing and Local Government approval. North Western EB circularised the local authorities in their area in June inviting suggestions on the resiting of networks. One snag is that the Ministry of Housing and Local Government, whose consent is needed by local authorities for this type of expenditure, are not likely to be enthusiastic while the Chancellor's squeeze is on.

The Stanwick scheme would cost about £1,300, of which Northampton CC has agreed to contribute one-third. The chairman of NWEB, Mr N. Marsh, envisages two or three such schemes being undertaken each year. He recently told the area's consultative council, on which local authorities are represented, that it was possible that in some localities where the demand for electricity had outgrown the capacity of the original system, existing lines would be replaced in due course by cables. In such cases, presumably, the board would bear the whole, or at least most, of the cost, for Mr Marsh mentioned separately the case of old installations, still satisfactory from a supply point of view, which the Board would be prepared to put underground on amenity considerations provided the costs were shared. Mr Marsh also said it was possible that a small part of the Board's 11 kV network would eventually have to go underground to make way for higher voltage lines.

So far, NWEB have not reached the stage of any concrete proposals. In their letter to the local planners they stress that purely amenity projects are not imminent as they are giving priority to rural electrification. Only a few replies to the circular have been received so far, but Lancashire CC for one is anxious to meet the Board on the matter simultaneously with neighbouring Manweb, and is also looking at Post Office lines.

Phoenix Merger Plan

THE electrical contracting firm, Phoenix Electrical Co. (London) Ltd. has received merger proposals from Faulkner Greene and Co., glazing contractors, with whom they share the same address at Marshalsea Rd, S.E.1. The two firms have been closely associated for many years and are often engaged on the same building projects. Faulkner Greene also have a branch at West Bromwich, Staffs.

B.E.A.B. Test 'Fridges

DOMESTIC refrigerators are the next on the list to be tested by BEAB. Announcing this the Board says approval will be "based on the safety requirements of BS 1691, which are being reissued as a BS 3456 section and cover safety, durability and reliability in service," indicating that the forthcoming reissue will be borne in mind when considering approval. Manufacturers are now being invited to submit their products and it is hoped to announce simultaneously on 15 Dec. those refrigerators which have been awarded the BEAB mark.

BEAB also announce a change of address from their present quarters in Cockspur St, S.W.1. From 24 Sept. they will be located at Mark Hse, 153 London Rd, Kingston upon Thames, Surrey (KINgston 6831).

BOARD 'FRIDGE SALES CAUSE SURPRISE

AFTER lagging in the doldrums for months, refrigerator sales by the area boards suddenly jumped in July to a level 88·4% above the corresponding month last year. No doubt a last minute rush by householders to beat the Chancellor's "Little Budget" was a factor, though in the event the majority of refrigerator manufacturers have not passed on the p.t. surcharge. In June, by contrast, sales of 21,653 refrigerators represented a fall of 27·4% compared with June 1960.

Washing machines also did well in July this year, with a gain of 57·7% on a year ago, against June's gain of 25·9%, but clothes dryers suffered a reverse for the first time in months.

Appliance sales by area boards	Sales in month ended 31 July, 1961		Sales in 12 months ended 31 July, 1961	
	Total	% change over corresponding month of 1960	Total	% change over previous 12 months
Cookers ...	32,166	+20·1	351,713	+ 3·8
Water Heaters:				
Immersion	24,388	+ 4·2	194,371	+ 1·1
Storage ...	5,366	− 2·5	63,523	− 4·9
Washboilers	4,561	+ 0·4	54,409	−10·8
Washing Machines ...	11,324	+57·7	104,319	−25·2
Refrigerators	30,938	+88·4	139,854	− 9·8
Clothes Dryers ...	1,983	−42·5	53,897	not avail.

Mouth-to-Mouth Resuscitation Endorsed

MOUTH-TO-MOUTH breathing as a method of reviving apparently asphixiated casualties is to be approved and taught by the leading first aid societies. This was announced last week. The move follows discussions with European countries experienced in using the technique. Previously, the Associations have adopted a cautious approach to the mouth-to-mouth method.

Under the new arrangements, mouth-to-mouth becomes the "method of choice." Its variant, mouth-to-nose breathing, will also be taught for use in some circumstances. The mouth-to-mouth method is included in the recently published ELECTRICAL TIMES placard of instructions on treatment of electric shock. Also to be taught by the societies is external heart massage, which can be applied to get the heart going when it has stopped from an electric shock accident.

The mouth-to-mouth method of artificial respiration is applied by the rescuer covering the casualty's mouth with his own, and pinching his nostrils with one hand. The rescuer breathes into the casualty's mouth, then turns his head away to take another breath, and repeats the operation. It is claimed that it results in much better ventilation of the lungs than methods such as Schaefer or Holger-Nielsen.

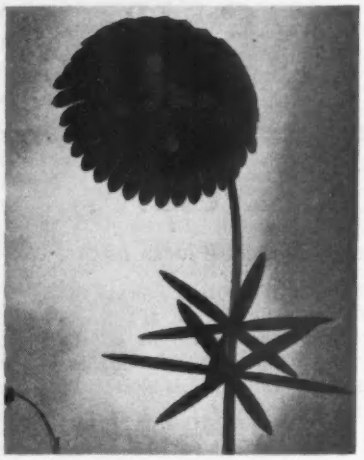
To offset aesthetic objections to mouth-to-mouth breathing, it has been suggested that specially-made airways shall be used, so that the rescuer breathes into these when they are fixed in the casualty's mouth. The first aid associations have decided against recommending the use of such appliances.

The Medical Research Council is understood to be investigating mouth-to-mouth breathing as a method of artificial respiration, but it has not yet reported its conclusions. The present decisions have been taken in anticipation of them.

EVENTFUL TRIALS FOR GLASGOW TRAINS

A DRESS rehearsal of Glasgow's electric train service last Sunday was far from uneventful, but at least some of the difficulties were due to a storm on the preceding day and there is a possibility that the service will restart soon. The trials were scheduled to last from 6 a.m. to midnight, but flooding of the track and trees across the line prevented a start until midday. During the afternoon there was a power failure, which was traced to a substation at Dalmuir and caused a further one-hour delay.

However, the performance of the trains themselves suggested that modifications to their transformers over the past 9½ months have been successful. Resumption of service depends largely on results of the trials, though rumours of a start at the beginning of next month were described by a BR spokesman as "speculation."



Not to be outshone by the "tree" lamp standard in Stuttgart's Central Gardens (ELECTRICAL TIMES, *2 Feb. issue*), *the New York authorities have erected this lamp-post, similar to a giant daisy, in the Central Park's children's zoo*

E.T.U. ELECTION STARTS

VOTING began this week in the election for the 11-man executive of the Electrical Trades Union, but full results are not expected to be known till early next month. The preliminaries were enlivened by circularising of branch officials by the self-styled ETU Reform Movement—who quoted extracts from the report by the TUC—and by Mr G. Woodcock, general secretary of the TUC, in addition to replies by Mr F. Foulkes, the president, to those activities.

There is already strong doubt whether any major change will result from the elections, partly because of the Union's voting rules, and because branch nominations for candidates were made before Mr Justice Wynn gave his judgment. There has also been strong agitation on behalf of the Communist candidates during which Mr Foulkes asked members to "compare the clean industrial record of the executive council members they are asked to replace with the record of those who want to seek the defeat of my progressive colleagues."

At a meeting of 50 full-time officials of the union last week-end, it was agreed that the possibility of setting up a committee of inquiry within the union should be examined by the sub-executive.

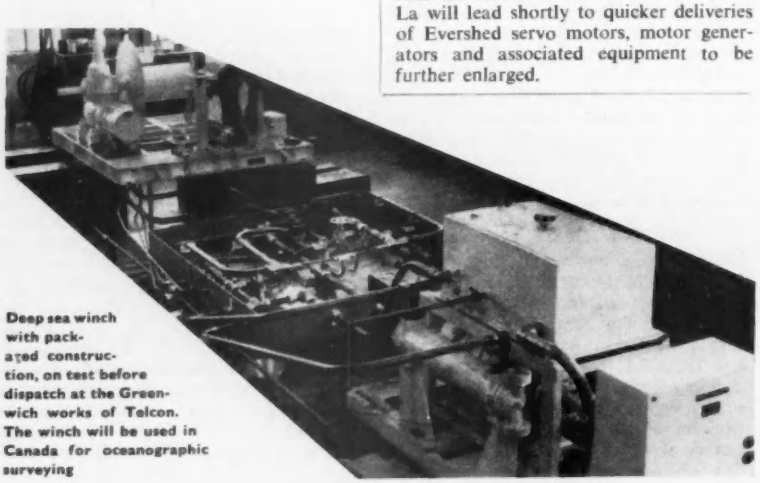
Deep Sea Winch for Canada

PACKAGE construction and sensitive hydraulic tension control are the features of a specially designed winch recently supplied to Canada by Telcon, a member of the BICC group. The winch will be used in deep sea oceanographic survey work and complies with requirements of the Department of Mines and Technical Surveys of Canada. The winch and its components are arranged in three packages which facilitates assembly on board ship. This arrangement was necessary because, initially, the winch will be installed on the survey vessel *Baffin* and later transferred to another vessel.

The winch barrel holds 30,000 ft of $\frac{3}{16}$ in. dia wire and when working at its extreme depth, with scientific apparatus attached, the wire will be operating very near to its yield point. For this reason, a tensioning control scheme is incorporated to allow for the varying amount of wire on the drum and also to avoid straining the wire by snatching. The winch barrel can rotate in either direction at a mean speed of 500 ft/min and may also run free for a gravity drop into the ocean or for wire changing. Control is by a simple hand lever. The winch is driven by a hydraulic motor and has a hydraulic control system. Power is provided by a double hydraulic pump unit driven by a drip-proof, squirrel-cage motor rated 35 h.p., 440 V, three-phase, 60 c/s.

The three package units comprise the winch and controller, a tray on which are mounted pipework, by-pass valves, and gauges, while the third unit consists of the power pack, reservoir and oil cooler.

Another contract by the engineering division of Telcon is for the supply of after-cable-laying machinery and ancillary equipment for a new 8,000-ton cable-laying ship now building at Cammell Laird's Birkenhead yard for Cable and Wireless. This ship which is due for completion next year, will have similar cable-laying equipment to that supplied by Telcon for the Post Office ships *Monarch* and *Alert*. The after-gear consists of five 6 ft dia sheaves, suitable for the laying of rigid submerged repeaters spliced into the cable. The sheaves are supported in fabricated steel frames and running-in roller bearings. Three of the sheaves are chain coupled while the remaining two are idler sheaves, with provision to give back tensioning during payout of the cable. The back tension gear has water-cooled brakes and slipping clutches to enable setting to a predetermined tension to suit the cable being laid. Two hydraulic motors provide the drives to the sheaves and these are powered by an hydraulic pump driven by a 125 h.p. electric motor.



Deep sea winch with packaged construction, on test before dispatch at the Greenwich works of Telcon. The winch will be used in Canada for oceanographic surveying

EVERSHED FORM MOTOR DIVISION

ADDITIONAL premises have been acquired by Evershed and Vignoles Ltd. to meet increasing demand for their fractional h.p. motors. Simultaneously, they have formed a new Motor Division which will handle the whole of the f.h.p. business from the new quarters at Devonshire Wks, Dukes Ave, Chiswick (CHIswick 7801). Mr E. H. Werninck, chief applications engineer, who deals with home and export sales, has also moved to the new premises. The Devonshire Works have been completely redecorated and adapted to their new purpose, and it is expected that the removal of these activities from Acton La will lead shortly to quicker deliveries of Evershed servo motors, motor generators and associated equipment to be further enlarged.

Local Authorities Take Second Look at Spending

THE effects of the "Little Budget" are beginning to percolate through to electrical contractors. A number of local authorities have suspended their house mortgage schemes and, in response to a circular from the Ministry of Housing and Local Government, still more are cutting down on such projects as street lighting improvements, swimming baths and recreation centres.

The order book of the building and civil engineering industry remains exceptionally high, though there is a tendency for the pressure of new orders to ease somewhat, but in the public sector demand seems bound to shade off by quite a few millions a year. One reason for this is that the central Government provides about a third of the aggregate expenditure by local authorities each year. In 1960, assistance from the central Government amounted to £741 million, and as the maximum reduction in expenditure is being aimed at, consistent with the maintenance of essential services and high priority development, a cut of perhaps 5% in the level of assistance seems possible. A reduction of that order could well mean that the cash flow of the construction industries would be reduced by around £100 million a year, or roughly 4%, while the squeeze lasts, with a distinctly noticeable effect on the order books of electrical contractors. Added to this would be the impact of high interest rates and general financial stringency on the activities of private developers.

In their circular, the Ministry of Housing and Local Government ask the local authorities to outline their likely housing and other development needs up to 1965-66 so that a phased programme can be drawn up on a national scale. The long-term objectives will presumably be published at a later stage as a guide to the industries concerned. So far, the Ministry of Transport has not sent out any parallel circular, and as far as the Ministry of Power is concerned the basic target for the self-financing of nationalised industries over a five-year period still applies.

OFFICIAL PUBLICATIONS

NJAC of the Electricity Supply Industry. Annual report for 1960-61 (see page 432).

BS 3396. Woven Glass Fibre Fabrics for Plastics Reinforcement. Parts 1 and 2. 6s.

BSI. Annual report, 1960-61. 7s 6d (see page 421).

BS Amendments: 738, Properties of Solid Insulating Materials, PD 4206; 1259, Intrinsically Safe Apparatus and Circuits, PD 4213; 1522, Projector Lamps, PD 4181; 2655, Electric Lifts, Part 3, PD 4204.

ERA Publication:
Protection of Circuits by Miniature Circuit-breakers, H. W. Baxter. 10s 6d.

Ionising Radiations (Sealed Sources) (Radiation Dosemeter and Dose Rate Meter) Order, 1961. SI No. 1710 (see page 432).

Commission in Eire

THE Government of Eire has now set up a 17-member commission, under recent emergency legislation, to inquire into the procedure of the Electricity Supply Board for determining remuneration of its staff and for the settlement of disputes on conditions of employment. The commission, formed as a result of the recent electricians' strike, is to make recommendations to the Government. Among the members of the Commission are Mr T. Murray, chairman of the ESB, and Mr P. G. Murphy, the Board's chief engineer.

LEEDS LIGHTS

"GLOW-WORM" lighting will give a decorative effect to the City square in Leeds soon, when it reopens to the public after extensive alterations. The fittings comprise 25 W lamps beneath strong glass portholes set in the pavement. Other improvements will be the floodlighting of the Black Prince statue and illumination of the flower beds.

Two Showrooms Modernised

TWO Boards inaugurated completely modernised showrooms last week. South Western EB re-launched Sidmouth, the latest of their service centres to be modernised, at a ceremony on Friday. At the ceremony, Mr S. F. C. Whitmore, the Board's deputy chairman, said the fact that the premises, originally opened in 1936, had not needed alterations until now spoke volumes for the foresight of the East Devon Electric Co. The Board, in its 13 years of existence, had connected 282,000 new consumers, more than trebled unit sales, and increased the number of farms on supply from 6,330 to 22,257.

The other newly modernised showroom is Eastern EB's premises at London Rd, Chelmsford, officially opened on Monday. Although the work involved converting what were originally two private houses, and later a showroom and store, into one large sales floor, the service centre was never closed down. Mr D. H. Walker, manager of Chelmsford district, said that at one stage he wondered whether business could be carried on, but sales had actually increased during that period. "If the staff can do that under those conditions, what can they be expected to do now?" he said.

C.I.G.R.E. SUBJECTS IN 1962

THE recently published list of papers to be presented at next year's CIGRE conference reflects the increasing use of computers both for design and operation. With newer forms of excitation becoming available, several papers in this field suggest a lively discussion, and greater interest is being shown in capacitors than in some previous conferences. Great Britain is presenting eight papers:

"Effect on generator design of short-circuit ratio, reactance and power factor," by H. I. Wood;

"Corona discharges in transformers," by E. R. Harthill, D. H. Ryder, L. Smith, F. W. Taylor and R. E. James;

"Mobile data recording unit for switchgear investigations on h.v. system," by R. E. Martin and S. A. Clarke;

"Economic aspects of automatic decentralised gas turbine generators," by A. N. Irens;

"Factors controlling life of power capacitors," by Z. Krasucki, H. F. Church and C. G. Garton;

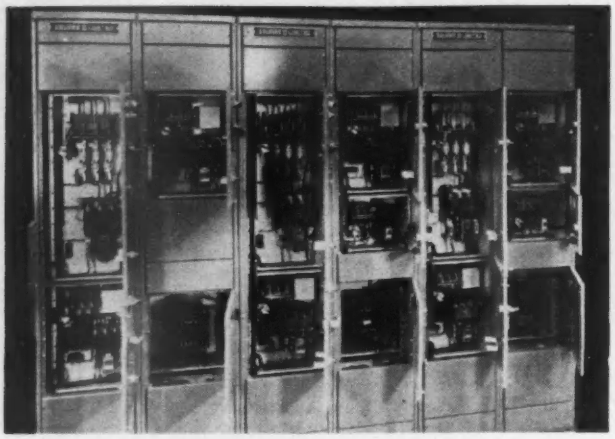
"Protection of metallic cable sheaths against corrosion," by B. O. Ashford, J. Banks, G. Ezard, J. H. Gosden and C. T. W. Sutton;

"Stability problems associated with large generators," by T. W. Barrie, S. D. Richardson, J. H. Banks and G. Shackshaft; and

"Developments leading to adoption of a new 400 kV transmission system in England and Wales," by A. Chorlton, H. B. Dreyfus, P. R. Howard and D. F. Oakeshott.

Road Heating at Park Royal

Specially designed road heating mats, of expanded steel, have been evolved by the GEC for installation on ramps and driveways to overcome ice and snow troubles on 1 in 6 gradients. The installation alongside, carried out by the Service Electric Co., is in a ramp being built at the Vanson Furniture factory, Park Royal Road, to permit parking of cars on the flat roof of the factory. Loading of the mats is 12 W per sq ft



Control Board for Baghdad

This 6-section plug-in motor control centre is to control the air-conditioning installation in the new Houses of Parliament, Baghdad. It has been supplied by Square D Ltd. to James Kilpatrick & Son, Ltd., the electrical contractors.

Work of the Advisory Council

THE value of the National Joint Advisory Council of the electricity supply industry, along with its associated district and local committees, in providing a unique forum for the discussion of a wide variety of subjects concerned with the industry is well indicated in the council's annual report for 1960-61 just published. These discussions during the year resulted in a further 16 recommendations being accepted or under consideration by the boards. Proposed changes in regional organisation in the industry, for instance, were outlined by Sir Christopher Hinton and subsequently discussed by the appropriate district councils and local committees.

Reference is also made to a plan for reorganisation of the Midlands Electricity Board, following the recommendations of a working party. The latter decided that a sub-area/district organisation should be continued, with general management, as distinct from functional control, at district level and above, and with districts of such a size that the distribution system could be operated from one depot. It is proposed to reduce the number of sub-areas from seven to six by 1963, and the number of districts from 36 to 31 by 1965. The impending changes will be further discussed by the local advisory committees.

A notable feature of the work of the District Joint Advisory Council's during the year was the encouragement given to the Local Advisory Committees to improve their communication with the general body of employees in the electricity supply industry. It is admitted that the keenness of some LAC chairmen to improve the work of their committees may tend to make them impatient of other members, while others occasionally fail to encourage their management colleagues on the committees to contribute to the discussion. Nevertheless, efforts are being made to extend the committee's influence among employees generally.

The main items discussed by area board LAC's under the broad heading of efficiency were: consumer relations and service; design and use of tools and equipment; local reorganisation, stores procedures, and inter-departmental co-operation. In the regional committees, the main subjects were plant availability and performance, station operational costs and results, effectiveness of tools and equipment, and the transfer of employees.

Plant or boiler overhaul sub-committees have been established at 42 power stations, and an example of their value is quoted at Ferrybridge "B," where the first unit overhaul to be carried out without manufacturers' assistance was completed in 12 days. Another recent development in consultation was the holding of informal departmental meetings associated with a number of local advisory committees, where most of the items discussed were raised by the employees themselves.

Health and safety matters were also discussed at some length, resulting in many practical recommendations. The suggestion scheme continued to receive full support under the revised rules which are designed to secure speedier assessment and fuller implementation, along with a higher level of awards. But the Southern Electricity Board has established its own suggestions scheme, independently of the DJAC, a decision regretted by the latter Council.

FOUNDRY CONFERENCE

ELECTRICITY in the Foundry is the subject of a two-day conference to be held at Wulfrum Hall, Wolverhampton, on 10 Oct. and 11 Oct. Organised by the Midlands Electricity Board, and supported by the Institute of British Foundrymen, the National Foundry College, and the BCIRA, the programme will include papers on arc, induction and malleabilising furnaces, electricity tariffs, materials handling and automation, and amenities in the foundry. Registration fee is £2.

ISOTOPES IN FACTORIES

SAFETY requirements applying when radioactive isotopes are used in factories are set out in six statutory orders made by the Minister of Labour and published by HMSO. These deal with particulars to be kept of maximum permissible radiation doses, and of doses received by each worker designated a "classified worker" under the Ionising Regulations (Sealed Sources) Regulations, 1961. They also cover medical examinations of such workers, and tests of instruments used to check radiation levels. The method of testing a sealed source is stipulated, and the level of leakage permissible stated. Other administrative matters are also covered in the regulations, all effective from 1 Feb. next.

Lectures on Isotopes

AMONG the short courses of lectures to be given at Hendon Technical College in the coming session are three of particular interest: "Applications of Radio Isotopes," "Transistors and Transistor Circuit Design," and "Electronics for Engineers." Fee for the first is 10s, and for the other two, 30s.

INDUSTRY IN IRELAND

A RENEWED drive to attract British industrialists to set up manufacturing units in Southern Ireland is being made by the Government of the Republic of Ireland. In recent years, British industry has accounted for one-third of Ireland's new industries from outside; but recently, the proportion has fallen considerably. Facilities offered to industries setting up factories include a non-repayable grant towards plant and buildings that in the case of the less developed parts of Ireland (generally the west) may amount to full cost.

To facilitate negotiations with firms inquiring into the possibility of manufacturing in Ireland, the Irish Industrial Development Authority has been set up. It is a statutory body charged with promotion of industrialisation. A new appointment of the Authority is a London representative, Mr G. B. MacCarthy, who is operating from the Irish Embassy, 17 Grosvenor Pl, S.W.1.

Apart from capital grants, firms manufacturing in Ireland and exporting their production enjoy special tax privileges. Generally speaking, there is complete exemption from both income tax and profits tax on goods exported by a new industry for ten years, and this is followed by a five-year tapering off period before full rates of tax are imposed.

Outside the scheme is the Shannon Airport area, which is being developed as a customs-free industrial estate with the emphasis on manufacture of goods which can be carried by air. Here again there are tax exemption privileges.

90% FARM ELECTRIFICATION IN SIGHT FOR SHROPSHIRE AND HEREFORDSHIRE

BY next spring, Shropshire and Herefordshire area of MEB hopes to have connected another 600 farms, bringing the number supplied to about 8,600 or nearly 90% of the total in the area. This is disclosed in a report just issued by Mr W. Winwood, manager of the area, who adds that the majority of the larger development schemes are now completed, nearing completion or scheduled in current programmes.

Starting with only 22% rural electrification in 1948, upwards of 83% of the farms in Shropshire and Herefordshire are now connected, which is only slightly behind the 87·4% achieved by MEB as a whole. Last year all previous records were broken when Mr Winwood's engineering staff added nearly 400 miles of mains and about 1,000 substations, thus supplying 5,300 new consumers, including nearly 700 farms.

Around £350,000 a year, or rather more than a quarter of the total capital expenditure, is being devoted to the rural development programme, and much of the remainder is for essential reinforcement to meet the rapidly increasing load. To meet the demand in Shrewsbury District a new grid supply point is being established this year by the CEGB at Uffington, and the area will be devoting £121,000 to its part of the project and the inter-connecting overhead lines. A new 33/11 kV substation is being established at Oakengates to reinforce supplies to Snedshill at a cost of £68,000. To meet the industrial load in Hereford, about £100,000 is being provided for the reinforcement of Hereford North substation by the addition of a third 30 MVA transformer. This will make Hereford North one of the largest MEB substations.

Another development receiving considerable attention in Shropshire and Herefordshire area is the provision of high-speed auto-reclosers to protect lines against transient faults. Over half of the 2,850 miles of h.v. lines in the area are now protected, and £18,500 is being spent on this work this year.

400 kV Trawsfynydd Line

PROPOSALS for the 400 kV transmission line from Trawsfynydd nuclear power station to Bangor, including a two-mile underground section across the Glaslyn estuary, have been approved in principle by the Snowdonia Pk Joint Advisory Committee. But the Committee is to urge that more of the route be underground. Concern was also expressed at the piecemeal way in which the CEGB's plans were put forward, and it was decided to ask the National Parks Commission to arrange a meeting with the Ministry of Housing and Local Government, the Minister for Welsh Affairs, and the Minister of Power, to discuss the general question of development by the Board in the National Park.

Washington to hire 'fridges

AS a result of a questionnaire to tenants, Washington Urban Council, Co. Durham, has been asked to install refrigerators in 700 council houses. To meet the cost each tenant will have 1s 7d a week added to the rent. The Council propose to borrow £21,000 for the purchase of the refrigerators.

Who said adequate wiring?

THE architects of council houses built at Buckland Brewer nine years ago made no provision for installing electricity as it was not thought that supply would ever reach the vicinity. Now, Bideford RDC are proposing to pay the £30 each for wiring the houses, but requiring the tenants to pay the rural development charge. SWEB have done it again!

Plessey Again in Takeovers

PLESSEY have acquired SPE Co., of Slough, makers of aircraft fuel pumps and associated equipment, in a deal believed to be worth around £500,000. SPE, which formerly belonged to the Booker group, will now operate as an autonomous wholly owned subsidiary of Plessey.

The name Philco comes up in two regards this week. First, there is the takeover bid in the US by Ford Motor for Philco Corporation. The second case is indirect; Radio and Television Trust, originally formed to acquire Philco's undertaking in the UK, has brought moves to acquire Thermionic Products (Electronics) to fruition. As they no longer make radio and TV sets, but concentrate in the main on applied electronics and high precision instruments, Radio and Television Trust intend to change their name. Since 1959, Philco manufacturing and sales enterprises in Britain, excluding Bendix, have been owned by Thorn.

Iodine Lamps in Production

WE have already referred to the latest advance in tungsten filament light sources, the iodine lamp. The principle—that the addition of a trace of iodine vapour to the argon filling enables the filament to be run at higher temperatures without blackening the envelope—is not new, but there has had to be considerable development work undertaken before it could be applied to production.

Now the Osram Lamp Division of the GEC, Wembley, have introduced the first production iodine lamps, in quartz envelopes, rated at 200 W and with 15% more light output. The initial production has been applied to the approach lighting of civil airfields and, at Luton, 96 are installed in a glide approach indicator system for demonstration purposes. They are said to have 2½ times the life of those in standard use on airfields and are enclosed in a conventional glass envelope as well with lamp-cap to suit existing fittings.

Tubular iodine lamps in 500 W, 1,000 W and 1,500 W ratings for floodlighting and industrial use will be available shortly and a 100 W projector lamp for home cine-projectors is in an advanced state of development. It will, however, be some time before the iodine lamp is applied to mass produced low watts rating lamps. Prices will be released in due course.

Another iodine quartz lamp is announced by Atlas Lighting Ltd. Rated at 625 W, 118 V it is only 75 mm long by 12·5 mm dia and has an output of 21,000 lumens. The life is twice that of a 500 W reflector photoflood, and the price is 59s 6d. Its main application is for cinematographic and photographic floodlighting, and is suitable for use with both Type A colour and monochromatic film.

Concealed Lighting at Salisbury

New lighting has been installed in the choir and Lady Chapel of Salisbury Cathedral using concealed lights mounted high up at triforium level. Coinciding with the removal of the altar screen to open up the view through to the Lady Chapel and east window, the new system has 150 W and 250 W reflector floodlights grouped in banks of three or four sited on the east side of the main columns. At night, facing east, it is practically impossible to locate the light sources, and in daylight the lamp housings blend unobtrusively with the Purbeck marble columns. Lighting levels have been graded down approaching the Sanctuary. The installation was carried out by the Salisbury district of the Southern Electricity Board

Heating and Ventilating Buildings

MORE than 28 papers are to be presented at the international conference on heating, ventilating and air conditioning which will be held at Empire Hall, Olympia, from 27 Sept. to 4 Oct. The conference has been organised by the Institution of Heating and Ventilating Engineers and it will consider the technical and administrative advances likely over the next ten years and the integration of architectural and engineering services for building construction. The conference will discuss industrial, commercial and hospital buildings under these three themes. In association with the conference, the first international heating and ventilating exhibition of its kind in Europe is being presented. Over 220 exhibitors, several from overseas, will be displaying from 26 Sept. until 6 Oct. The exhibition will be open from 10 a.m. until 6 p.m. or 9 p.m. on 28 Sept. and 4 Oct.

Capital Expenditure revised Downwards

A LEVELLING out in capital investment by the manufacturing industries in the second half of this year is indicated by BoT estimates. Whereas in January it was expected that investment this year would be fully 30% higher than 1960's £1,034 million, the increase is now expected to be nearer 21%.

If achieved, this would compare with 18% in 1960, but the estimates are based on pre "Little Budget" information.

E.W.F. FUNCTION

ANNUAL function of the Scottish section of the Electrical Wholesalers' Federation will be held at the Marine Hotel, North Berwick, from 3 Oct. to 6 Oct. The Council of the Federation is to hold a meeting on the morning of 4 Oct. at which it will be joined by the Scottish members. There is to be a golf competition, and a dinner on 5 Oct.

Sayings OF THE WEEK

"Since no end-of-apprenticeship tests are insisted upon, the studies in a technological college are voluntary both in the sense of attendance, and in the sense of acquiring a qualification." . . . MR H. A. WARREN, principal, S.E. London Technical College, at the annual conference of the British Association for Commercial and Industrial Education.

"It is clear that initial assumptions that the gates to the desired region of superhigh temperatures are going to open without any noise at the first pulsation of the creative energy of physicists are unfounded." . . . ACADEMICIAN ARTSIMOVICH, USSR representative, at the IAEA conference on controlled nuclear fusion.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, September 19

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	228¾	−3
,, (3 months)	232½	−2½
LEAD, refined pig, 99·97% purity (cash)	64	−½
,, (3 months)	65¼	−⅛
TIN, refined, min. 99·75% purity (settlement)	940	−4
(3 months)	953	+2
ALUMINIUM, ingots 99·99-5% ...	186	—
,, wire bars (4×4×54")	193½	—
BRASS Strip 63/37	198½	—
SILVER (Troy oz)	79⅛d	—
ZINC, virgin, min. 98% purity (cash)	73½	+1½
,, (3 months)	74½	+1½
RUBBER, per lb No. 1, RSS, spot	25½d	−⅛d
c.i.f. basis, ports, Nov. ...	25½d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	68½	—
Mild Steel Tape (0·04 in.) ...	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	62	−1
AMERICAN PRICES: Copper, electrolytic (per lb) ...	31c	—
Lead (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

LARGE CONTRACTS AWARDED

ABERDARE Cables Ltd. have received an urgent contract for the supply of 16,000 ft of p.v.c-insulated, wire-armoured, p.v.c-sheathed low voltage cable for the Kraft Bag Plant at Suceava, Roumania.

A CONTRACT for the h.t. electrical distribution system at the University of Sussex, Brighton has been awarded to Crompton Parkinson Ltd., the contract includes 11 kV switchgear, transformers and ring main cables for the various substations.

FOR the treatment of bearing rings 7 in. dia to 12 in. dia, followed by oil quenching, the Hoffmann Manufacturing Co. ordered an electric furnace capable of treating work at the rate of 80 lb/hr, and associated equipment from Wild-Barfield Electric Furnaces Ltd. The furnace, of the mesh belt conveyor type, will be heated by nickel-chromium tubular elements fed at low voltage from transformers, and arranged in two zones to give a total rating of 65 kW.

AN order for instrumentation worth over £32,000 for Trawsfynydd nuclear power station, has been placed with George Kent Ltd. It includes over 40 electronic strip chart instruments for use in recording of fuel element, graphite and gas temperatures, reactor gas pressures and flow, reactor power levels, and burst can detection.

Whiteley's 75th Anniversary

PRODUCTION of "Elephantide" insulating pressboard in India is expected to commence in Mysore next year, Mr William Whiteley, chairman of B. S. and W. Whiteley Ltd., announced last week-end at a luncheon to mark the seventy-fifth anniversary of the British firm. All initial formalities had been completed for the formation of a new company, Senepathy Whiteley Private Ltd. A site had been purchased and machinery was being assembled in the factory, he added, extending a special welcome to five Indian trainees attending the luncheon who were to take over production in India.

Referring to the company's proud export record, he said that last year they exported direct from the Pool-in-Wharfedale factory, products to a value in excess of the whole production of 1947, the first year of its public company status. Mr A M. Browne, president of BEAMA, also paid tribute to the notable part played by Whiteleys in the development of the electrical engineering industry over the past 40 years.

Subsequently, long-service awards were presented, including one to Mr Holmes Whiteley, a director and brother of Mr William Whiteley, and gold watches for over 25 years' service to five women and 39 men.

News in Brief

Subject to approval by the Ministry of Housing and Local Government, Bootle Housing Committee is to provide electric firelighters in 16 houses in the Netherton smoke control area No. 3. The Committee will pay a share of the cost of the installation.

A new automatic telephone exchange at Jebbel-Amman, Presidential district of the Jordan capital, was put into operation last week-end. It is one of several for which AEI are supplying the equipment.

An extensive national Press and ITV advertising programme is being launched by Ekco Heating and Electrical Ltd. for their electric heaters and blankets.

A £350,000 scheme for standardisation of the power distribution system in the Stroud district of the Midlands Electricity Board has been completed nearly two years ahead of schedule.

A special course of six lectures on "Fuel Cells for Power Production" is to be given at Regent St Polytechnic on Monday evenings from 16 Oct. Fee is £1 1s.

LEB. North Western District, once again provided a marquee for the display of appliances at Willesden Borough's annual show this month. A dozen manufacturers co-operated, and the majority of the 35,000 visitors to the show passed through the marquee.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Ontario Plans

Plans for further power development on the Mattagami River are being prepared by the Hydro Electric Power Commission of Ontario. These will follow the Little Long Rapids 114 MW project, which is scheduled for operation in 1963. About 13 miles downstream from Little Long Rapids, another generating station, to be named Harman, will be built. Construction is scheduled to start about the middle of next year, with three sets totalling 110 MW in operation by October, 1965. Still further downstream, the projected Kipling station is to be completed in 1966 with a capacity of 132 MW from three machines.

U.S.A.

Waiting a Decision

Standing clear of the Ottawa-British Columbia squabble on the respective advantages of the Columbia or Peace River power developments, US power officials are waiting for the scene to clear, it seems. Their attitude is that it is an internal matter for Canada, and any action on their part might be misconstrued as interference. But the argument going on in British Columbia could have serious repercussions in the Pacific north west area, where additional low price energy will soon be required to meet growing industrial demands. Anxiously awaiting a deal on power from the Columbia River development when the Treaty is ratified, they are apparently not interested in power from Peace River, development of which has now been taken over by the BC Government. Mr C. F. Luce, head of the Bonneville Power Administration, for instance, has already indicated their willingness to proceed with the Columbia plan. But the Canadian Parliament has not yet ratified the treaty. Premier Bennett, of BC, is in dispute with Ottawa over financing and power export rights, and has, meantime, indicated making an early start on the Peace power project. In the Pacific north west it is feared that the latter move might doom the present Columbia plans and, to meet power requirements, an alternative and much more costly project in the Columbia River basin in the US may become necessary.

W. INDIES

Natural Gas to Replace Oil

Under the above heading in ELECTRICAL TIMES for 10 Aug., 1961, we stated that the Trinidad and Tobago Electricity Commission had recently invited tenders for the supply and erection of two 12·5 MW turbo-alternators and ancillary plant for the "B" station to be built at Colesville. We regret that the rating of the sets was incorrectly stated. The sets are actually to be rated 50 MW.

INDIA

Power from Hirakud

Power-short Madhya Pradesh is to get 5,000 kW from the Hirakud project, at the end of its first stage, it has now been announced by the Orissa Government. It seems that originally the latter was expected to provide 10,000 kW but afterwards declined to do so, and the matter was taken up with the Central Government. The new arrangement is the result. The power supply will be brought by a 132 kV line from Jharsuguda to Raigarh. The two states will share the expenditure on the cost of construction and maintenance of the line in their respective jurisdiction.

Joint Agreement

India and Bhutan last week signed a formal agreement for the establishment of the Jaldhaka hydro-electric project on their borders which will benefit both countries. This is part of an arrangement under which India is providing finance for the general development of Bhutan.

AUSTRALIA

Switchgear Order

A £231,000 order for 6·6 kV auxiliary switchgear at Hazelwood power station has been placed with Associated Electrical Industries Ltd., by the State Electricity Commission of Victoria. This order is for 104 metalclad compound insulated 350 MVA vertical plug-in equipments. AEI are already supplying two 200 MW turbo-generators, main transformers and main 200 kV switchgear for the station.

Tasmania's Progress

Over 71% of the domestic consumers served by the Hydro Electric Commission of Tasmania have an electric cooker and 65% have an electric water heater. This indication of the well advanced electrification of the State is given in the Commission's annual report for the year ended 30 June, 1960, just received. Due to a mild winter and a lull in industrial growth, unit sales for the year only rose by 4·2% to a total of 2,173¼ million, but Mr A. W. Knight, the Commissioner, points out that the lull has now come to an end, and considerable industrial activity is in progress. It is, therefore, necessary to look ahead to future power developments to follow Poatina.

Diesel Plant

To provide their own generating capacity for their gold fields at Kalgoorlie, Western Australia, four 1,220 kW diesel generators have been ordered from Mirrlees, Bickerton and Day by North Kalgurli (1912) Ltd. The order, worth £170,000, is for four 1,725 b.h.p. eight-cylinder turbo-charged diesel engines direct coupled to Brush 1,220 kW alternators. The machines are to be delivered between December, 1961, and February, 1962. The engines are to operate on heavy fuel oil—about 30% cheaper than diesel fuel—which is expected to result in a substantial decrease in the power charges/ton of ore treated. The plant will supply all the power requirements of the mine, making it entirely independent of outside supply. It was this decision, in addition to the move of other concerns to acquire their own plant, which has prompted the Kalgoorlie Electric Power and Lighting Corporation Ltd. to close down its steam generating plant at the end of 1962, as we reported on 6 July.

No Preference?

Tasmania is alone in the Commonwealth in being bound by Act of Parliament to charge the same rates for electricity outside Hobart as are charged within the city. This point was made recently by Mr A. W. Knight, the Hydro Electric Commissioner, in replying to a request that there should be a reduction in power charges for agricultural users, especially for irrigation purposes. He also emphasised that the cost of maintaining electricity services in rural areas is high, and such consumers are already subsidised by those in urban areas.

Selling All Appliances

Extension of the commercial activities of Sydney County Council's Electricity Department to include all types of electrical goods, including "shelf" goods, such as toasters, jugs, razors, in addition to television and radio sets, was decided upon by the Council last month. Previously the department has only sold large domestic appliances, such as cookers, refrigerators and washing machines, as well as heavy industrial and commercial equipment. But the new decision has not gone unopposed, and a number of councillors have urged reconsideration of the matter. They maintain that the Department's function is to distribute electricity, and that selling of appliances should be left to existing retailers from whom the type of apparatus is readily available. Various associations in the State are also supporting this opposition move.

Company Activities

FURTHER drift in stock markets. No doubt happy boom-time days will come again but at the moment they appear a very dim and distant prospect. Last week's dullness in equity sections was certainly not helped by news that the UK steel industry recorded a further sharp fall in production in August so that the industry is now working at about 78% of available capacity. Reports, too, that motor-car production is expected to fall between 15% and 20% before Christmas did nothing to help sentiment at the end of a Stock Exchange Account. Had it not been for the disclosure last week of the decided improvement in the overseas trade deficit last month—the trade "gap" was cut from £31 million in July to £22 million, with exports rising hopefully by £17 million to £324 million—the market would doubtless have drifted even lower.

Electrical issues, too, last week were setting a less shining example. GEC after its recent rally was quick to tire and from 30s 6d the £1 Ordinary shares slipped back at one time to equal the "low" of 28s 9d before edging back up to 29s. AEI fluctuated between 38s 3d and 37s before closing the week at 37s 3d and English Electric, too, shed 1s 3d to 29s. Hoover "A" shares at one time looked as if they were about to throw off the wash-day blues when they spun up from 42s 1½d to 43s, a level they held for three consecutive market days, but by the end of the week's business they had splashed back to 42s 3d. EMI, taking their cue from an easier Wall Street, drooped sadly from 37s 4½d to 35s 6d, while Plessey faded from 47s 9d to 47s 3d. On the brighter side, Berry's Magicoal warmed up from 53s to 53s 6d, and British Electronic Industries—the Pye-Ekco merger group—after a 1s 1½d setback to 10s 1½d on the results recovered to 11s.

Star turn of the price risers last week, however, was Pifco, whose group profit rose from £227,601 to £253,128 before tax. For the third successive time there is a five-point increase in dividend bringing the total to 35%. For good measure, chairman Mr A. Webber also proposes to make a one-for-one scrip issue in "A" Ordinary shares. Unlike most "A" shares these will carry voting power, albeit at a diluted rate of one vote for every ten "A" shares. This was all sufficiently cheering to mark up the Pifco shares from 54s 3d to 56s 3d at one time before they closed the week at 56s.

Dimplex, too, was a lively mover last week. Before the announcement of its excellent results the 5s Ordinary shares had actually turned 4s 6d a time colder at 74s 6d. But then the chairman of this booming heater business, Mr E. J. Wade, announced a £555,135 before-tax profit for the year to 30 June against £310,371 in the previous year, dividend up from the equivalent of 25% to 35%—it would have been bigger but for the Chancellor's plea—and a two-for-three scrip issue. Suddenly, the shares turned hot once more with a 5s 6d jump to 80s and then finished the week at 80s 10d. Still on only a 2·2% dividend yield, but with the dividend 4·1 times covered, the shares still appear to promise protection from any stock market chill this winter. In the first ten weeks of their current year orders have been received at a higher level than last year and the board is confident that the company will continue to receive a substantial part of the market in heating appliances.—*From our City Correspondent.*

British Relay Wireless and Television

Apart from a 41% rise in trading profits, which is in line with forecasts last February, the most significant point in the preliminary statement is a new provision of £200,000 to allow for any change in the TV line standard and other design contingencies. As a result, net profit comes out lower at £530,708 for the year to 30 April, against £676,769, whereas trading profits rose from £2,474,606 to £3,516,985. Dividend is steady at 17% for the year, as forecast at the time of the rights issue eight months ago. The final 7% is payable on the higher capital.

Dimplex

The soaring growth in profits continued in the year to 30 June, with profit before tax up 79% at £555,135 against £310,371 in 1959-60. Dividend is raised by 10%, and but for the Chancellor's dividend pause it would have been more. This makes the year's distribution 35%, moveover, the directors announce a two-for-three scrip issue. The new financial year, too, has started well. Orders in the first ten weeks are at a higher level than last year, for which the company is well prepared, production having been maintained at a "very high" level throughout the summer to build up stocks.

James Howden

Profit before tax fell from £929,514 to £802,524 in the year to 30 April, but dividend is maintained at 25%. Net profit comes out at £421,705 of which the dividends absorb £209,016.

Kalgoorlie Electric Power

Net profit fell from £55,637 to £37,140 for the year to 31 March, but dividend is raised from a 6% rate to 10%, absorbing £5,742. As the company intends to cease generation at the end of 1962, there is no provision for plant modernisation in the latest accounts, but £25,000 goes to general reserve. In the previous period, provision for plant modernisation was £50,000, and this too is now transferred to general reserve. The decision to cease generation, announced last June, results from a failure to reach a long term power agreement with large gold mines in the area combined with the local authority's intention to install their own generating plant by 1962.

Pifco

Dividend is raised by 5% for the third successive year, bringing the payment for the year ended 30 April to 35%. Before tax, group profit has risen from £227,601 to £253,128. The net result is £123,963 against £115,534 previously. Directors have also announced a scrip issue of "A" Ordinary shares with restricted voting rights. The issue will be on the basis of one 4s "A" Ordinary for each four Ordinary shares held on 13 Oct., and will capitalise £100,000 of reserves. Approval of directors' proposals to increase the present issued capital will be sought at the A.G.M.

Pye

Certain of Pye's electronics products, such as telecommunications equipment, are to be manufactured in France by Schneider Radio-Television under a long term technical agreement just announced. Marketing of the goods covered by the agreement throughout the franc area will be by a joint sales subsidiary to be set up. In the more distant future, Schneider intends to develop its own electronic products, and would be prepared to grant Pye the licence to manufacture them. Radio and TV sets and gramophones are not covered by the agreement.

Sangamo Weston

Half-yearly results are much better than might be expected, in view of the competitiveness of the motor market and the chairman's forecast some months ago that earnings this year may well be lower though demand continued to be satisfactory. Trading profit for the six months to 30 June is £325,652 against £268,200 in the previous corresponding period. After deducting higher depreciation of £76,965 (*£68,668*), profit before tax come out at £248,687 (*£199,532*).

John Thompson

Hopes for an interim dividend have been realised with a payment of 5%, and matches the distribution of a year ago, but the final for 1960 was omitted. In 1959 the interim was 7½% and the final 12½%.

Dividends Announced

Arcolectric. Interim 7½% (*same*).

Ether Langham Thompson. Interim 5% (previous equivalent 4·69%) shares from recent rights issue do not participate.

A. H. Hunt (Capacitors). Interim 5% (*same*).

C. A. Parsons. Interim 10½d (*same*).

A. Reyrolle. Interim 3½% (*same*).

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

22 Sept.—Doncaster R.D.C. Supply and installation on fixed-price basis of 64 140 W sodium lamps on 25 ft steel columns along A614, Thorne Rd, Austerfield.—See 7 Sept. issue.

23 Sept.—Belper U.D.C. 30 140 W sodium lighting units on pre-stressed concrete columns along A6, Derby Rd, Milford.—See 7 Sept. issue.

25 Sept.—Belfast. Electrical installation in new residential Club for Seamen, Garmoyle St.—See 7 Sept. issue.

25 Sept.—Dalton-in-Furness U.D.C. Supply, installation and wiring of 12 Group "A" sodium lighting units/steel columns. Engineer and Surveyor: A. W. Charity, Town Hall. Deposit £1 1s.

25 Sept.—East Devon Water Board. Contract S.2. Duplicate pumps/equipment for Holyford Wks.—See 7 Sept. issue.

25 Sept.—Esher U.D.C. 27 25 ft steel columns/brackets/sodium lamps/gear, etc., along A3.—See 7 Sept. issue.

25 Sept.—Flintshire C.C. (a) Supply and laying of cable and (b) advanced direction signs, etc., for Queensferry By-pass lighting scheme.—See 7 Sept. issue.

25 Sept.—Gravesend B.C. Electrical improvements in 955 houses on Westcourt, Northcourt and King's Farm estates.—See 7 Sept. issue.

25 Sept.—Largs B.C. Separate trades tender No. 7. Electrical work in six one-apartment flats, Boyd St. Applications to Town Clerk: J. G. Young, Municipal Chmbrs, by above date.

25 Sept.—Lytham St. Annes B.C. Nine new concrete columns, 85 c.i. columns, repositioning of 25 c.i. columns and renewal of 42 c.i. brackets on existing columns.—See 31 Aug. issue.

25 Sept.—N.I. Hospitals Authority. (3) Electrical and (4) lift installations in H.Q., 27 Adelaide St. Applications to Secretary, 27 Adelaide St, Belfast 2, by above date.

25 Sept.—Tonbridge R.D.C. Wiring, on fixed-price basis, of three blocks of four one-bedroom flats and 13 pairs of three-bedroom houses at Paddock Wood, Lamberhurst and Five Oak Green. Engineer and Surveyor, 48 Pembury Rd. N.I.C. firms only.

25 Sept.—Urmston U.D.C. 31 Class "A" lighting units in Trafford Pk.—See 14 Sept. issue.

26 Sept.—Birmingham C.C. Replacement of lift, on fixed-price basis, in aged persons' home, Highbury Hall.—See 14 Sept. issue.

26 Sept.—Hebburn U.D.C. (2) Electrical installations in King George V playing field pavilion. Engineer and Surveyor, Council Offices, Argyle St. Deposit £3 3s.

26 Sept.—Leeds Hospital Board. (b) Electrical installation in new ward block at Bempton La Hospital, Bridlington. Applications to Regional Engineer, Park Parade, Harrogate, by 12 noon, on above date. Deposit £2 2s.

26 Sept.—Manchester C.C. Supply of bollard and transport batteries for year to 31 Dec., 1962. City Surveyor, Town Hall.

27 Sept.—Durham C.C. Electrical installations in: Brandon Modern and Spennymoor Recreation Ground Nursery schools and in Victoria St, Hartlepool, police houses. Applications to County Architect, South St, Durham, by above date.

29 Sept.—Cheshire C.C. Applications invited for inclusion in select list for: (f) electrical installations.—See 7 Sept. issue.

2 Oct.—Birmingham Tame and Rae. Magnetic flow meter unit 12 in. dia, including chart recorder with integrator and cabling. Engineer, District Drainage Board, Rookery Pk, Erdington, Birmingham 24.

2 Oct.—Manchester C.C. Renewal and reinforcement of electrical installation in Police H.Q.—Advertised 14 Sept. issue.

2 Oct.—Neath R.D.C. 37 15 ft concrete columns/60 W sodium lamps/lanterns/gear/wiring along B4434, Tonna.—See 7 Sept. issue.

3 Oct.—Thurrock U.D.C. Provision and erection of 11 Group "A" street lighting units along A13, London/Tilbury Trunk Rd. Engineer and Surveyor, Council Offices, Whitehall La, Grays. Deposit £2 2s.

4 Oct.—Batley B.C. Supply of tungsten and discharge lamps for Street Lighting Dept. Borough Engineer, Hanover St.

4 Oct.—Stockport B.C. (1) Rewiring of Weights and Measures Office and associated buildings, Castle Yd.—See 7 Sept. issue.

5 Oct.—Slough B.C. Electrical installation in part of sewage disposal works, Cippenham. Borough Engineer, Town Hall. Deposit £1 1s.

6 Oct.—Dunbarton C.C. Supply of round steel columns: 30 of 25 ft, 155 of 15 ft and 229 of 10 ft 6 in. Supply of fluorescent lanterns: 30 with 3 x 80 W tubes; 134 with 2 x 40 W 2 ft tubes; 229 with 2 x 40 W or 4 x 15 W tubes for post-top mounting; 136 with 2 x 80 W or 2 x 13 W tubes (bulkhead type). District Clerk, D.C. Office, Main St, Cumbernauld.

6 Oct.—Meath C.C. (b) Electrical installation in new vocational school at An Uaimh. Details from consulting engineer: G. J. Larchet, 129 Rathgar Rd, Dublin 6. Deposit £10 10s.

6 Oct.—Ulster Transport Authority. Supply of (Contract 65) batteries and battery plates; (Contract 77) accessories, adaptors, plugs, switches, etc.; (Contract 78) p.v.c. and cotton sleeving. Details from Stores Superintendent, Duncrue St, Belfast 3. Fee 1s each form with addressed label.

9 Oct.—Manchester C.C. Electrical installation in fourth floor of Central Library. City Architect, P.O. Box 488, Town Hall.

11 Oct.—Newtownards B.C. Supply and erection of two submersible pumps each for 142 g.p.m. at 130 and 260 ft heads, respectively, to be complete with pipework, valves, fittings, instruments and control gear. Borough Surveyor, Town Hall, Conway Sq.

12 Oct.—Northwich R.D.C. Supply and installation of 38 30 ft concrete columns/200 W sodium lamps/lanterns/gear along A49 at Cuddington.—See 7 Sept. issue.

12 Oct.—Sunderland C.B.C. Electrical installation in Town End Junior and Infants' Schools, Borough Architect, Grange Hse, Stockton Rd.

13 Oct.—Belfast C.C. Specification W.199. Supply/erection of v.h.f. fixed and mobile, frequency modulated, 25 kc/s channel spacing radio-telephone equipment. Electricity Dept., East Bridge St, Belfast 1. Deposit £2 2s.—Advertised in this issue.

13 Oct.—Fylde Water Board. Contract 149: Supply and installation of lighting and power supplies to pump house, Wyre La, Garstang. Contract 150: Supply and installation of lime dosing pump, pH control equipment pipework and wiring at Stocks Filter Hse, Slaidburn, Yorks. Engineer, Sefton St, Blackpool.

13 Oct.—Midlothian C.C. Supply and erection of: ten 140 W, six 60 W and 111 45 W sodium lighting units on steel columns; conversion of 49 units to 60 W or 45 W sodium lighting and ancillary works at Polbeth and Limefield, West Calder. County Surveyor, 32 Palmerston Pl, Edinburgh 12.

13 Oct.—Whickham U.D.C. Provision of street lighting at Swalwell Bank, Dunston Bank and King George Ave, Dunston. Engineer and Surveyor.

16 Oct.—Down C.C. Electrical and lift installations in new H.Q. offices at 18 Windsor Ave, Belfast. Details from consulting engineers: Varming and Mulcahy, 37 Malone Rd, Belfast 9. Deposit £3 3s.

16 Oct.—N. Riding C.C. Lighting of A174 roundabout at Ormesby. County Surveyor, County Hall, Northallerton.—Advertised in this issue.

20 Nov.—E.B. for N. Ireland. Specification N.I.1640: power control and indication cables for No. 4 boiler, turbo-generator and associated equipment. Documents to be issued by 2 Oct. by consulting engineers. Kennedy and Donkin, 64 Royal Exchange, Manchester 2. Deposit £2 2s, made payable to E.B. for N. Ireland.

No date stated—Betwys-y-Coed U.D.C. 63 trunk road lighting columns with sodium lighting.—See 14 Sept. issue.

No date stated—Leeds. Floor-heating installation in new 5,000 sq ft premises. Details from Moore and Co. (Leeds) Ltd., 51 St. Paul's St, Leeds 1.

No date stated—N. of Scotland H.E. Board. Three mile 132 kV single-circuit steel tower line in Argyll.—Advertised 31 Aug. issue.

No date stated—Southampton C.B.C. Supply and installation of dual fuel engines, alternators, switchgear and associated plant at Millbrook Sewage Wks. Borough Engineer, Civic Centre.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 108 queries answered this week

"Kingsway" vacuum cleaners—address for spares? T.E.—Remoco Ltd., 33 Priory Park Rd, N.W.6.

Slenderella Systems Inc., Stamford, Connecticut, U.S.A.—agents for? M.C.—Slenderella Slenderizing System Ltd., 172 New Bond St, W.1.

"Twinnyvac" vacuum cleaners—agents for? G.B.—F. Horn, 55 Park La, W.1.

"Humex" greenhouse heaters—makers of? M.J.—Roberts Electrical Co. Ltd., 11 High Rd, Byfleet, Surrey.

"Precision" soldering irons—suppliers of? E.B.—Antex Ltd., 6 Idol La, E.C.3.

"Lens-Lite" combined magnifier and local lighting fitting—makers of? E.E.W. E.D.L. Industries Ltd., Redbrook La, Brereton, Rugeley, Staffs.

"A.E.M." starters—makers of? E.E.B.—Airedale Electrical and Mfg. Co. Ltd., Harrogate Rd, Apperley Bridge, Bradford, Yorks.

"Audion" soldering guns—makers of? H.G.—Elektro-Audion, Groenburgwal 31, Amsterdam, Holland.

ANSWER WANTED

"Hansen" Japanese type SC pocket size multi meter—agents for? J.T.C.—

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

27 Sept.—America. 20,000 ft 16 A.W.G., four-conductor, rubber jacketed and insulated cable. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/28848/61).*

28 Sept.—Germany. Lamps (various types). U.S. Army Procurement Center, Frankfurt-am-Main. B.o.T. (ESB/29460/61).*

29 Sept.—Argentina. Work value 104 million pesos for 32/13 kV, telephonic and pilot cable in Bahia Blanca network. Direccion de la Energia, Calle 6, No. 636, La Plata, Buenos Aires. B.o.T. (ESB/28525/61).*

30 Sept.—Lebanon. Beacon, power and telephone cables (12 items) for Beirut International Airport. L'Administration des Adjudications, Inspection Centrale, Immeuble Mansour Salameh, Rue Chateaubriand, Beirut. B.o.T. (ESB/29448/61).*

30 Sept.—India. 21 shadowless operation lamps of 18, 28 and 32 in. diameter and X-ray apparatus. Details from Trade Agent for Mysore, 28 Cockspur St, S.W.1. B.o.T. (ESB/28851 and 4/61).*

3 Oct.—Pakistan. Cable, wire, conductors, steel rope (23 items). Director of Supply, P.I.D.C. Hse, Motijheel, Dacca. B.o.T. (ESB/29411/61).*

9 Oct.—Argentina. 33/13·2 kV transformer substation for Adolfo Alsina. Direcion de la Energia, Calle 6, No. 636, La Plata, Buenos Aires. B.o.T. (ESB/29718/61).*

10 Oct.—India. 220 kV double-circuit steel transmission towers (15,000 ton). Chief Engineer (Construction), Projects Section, Punjab State Electricity Board, 9 Ram Bagh Bldg, Patiala. B.o.T. (ESB/28599/61).*

16 Oct.—Australia. 22 kV 3-ph. oil-insulated self-cooled outdoor type transformer for Morwell Power Station. S.E.C. of Victoria, 22-32 William St, Melbourne C.1. B.o.T. (ESB/28519/61).*

16 Oct.—Australia. Four 6·6 kV transformers for Vales Point Power Station. E.C. of N.S.W., 15 Castlereagh St, Sydney. B.o.T. (ESB/29431/61).*

16 Oct.—India. 3,000 11 kV outdoor 3-ph. gang operated air-break switches. Chief Engineer (South), Stores Purchase Section, Punjab State Electricity Board, The Mall, Patiala. B.o.T. (ESB/29974/61).*

23 Oct.—India. One 150/30 ton indoor o/h travelling crane. Tender Inquiry HCP/SVHEP/2 details, fee £3 15s, from Co-ordinating Branch, India Store Dept., Bromyard Ave, W.3. Viewing reference S. 3399/61/NSC/ENG.2.

CONTRACTS PLACED

C.E.G.B. Contracts placed during the past two months amounting to £23 million include: Blyth "B" Power Station: heating, lighting and plug point installation for turbine house, boiler house and ancillary buildings, F. H. Wheeler and Co. Ltd.; H.P. pipework and valves for Nos. 7 and 8 turbo-generators and Nos. 7 and 8 boilers, John Thompson (Pipework) Ltd.—Thorpe Marsh Power Station: three 4,800,000 g.p.h. natural draught cooling towers, Nos. 2A, 2B and 2C, Davenport Engineering Co. Ltd.; 11 kV switchgear and accessories, A. Reyrolle and Co. Ltd.; two 310 MVA, 275 kV generator transformers Nos. 2A and 2B, Associated Electrical Industries Ltd.; 3·3 kV switchgear and accessories, the English Electric Co. Ltd.—West Burton Power Station: coal handling plant, Birtley Eng. Ltd.; main C.W. pumps and motors associated with Nos. 1, 2, 3 and 4 500 MW turbo-generators, Gwynness Pumps Ltd.; installation and maintenance of site electricity supply system (stage one), James Scott (Electrical Engineers) Ltd.—Drakelow "C" Power Station; 11 kV auxiliary switchgear units Nos. 9 and 10, A Reyrolle and Co. Ltd.; two 350 MW reheat boilers Nos. 9 and 10, John Thompson Water Tube Boilers Ltd.; contactor control gear (stage two), Laurence, Scott and Electromotors Ltd.—Aberthaw Power Station: 13·8 kV and lower voltage cables and accessories, London Electricity Board.—Dungeness Power Station: 275 kV air-blast switchgear, A. Reyrolle and Co. Ltd.—Richborough Power Station: power, control and auxiliary cables, London Electricity Board.—West Thurrock Power Station: installation of lighting, heating, telephones and ancillary services associated with sets 1-4, James Kilpatrick and Son Ltd.; 275 kV switchgear extension, A. Reyrolle and Co. Ltd.—Marchwood Central Engineering Laboratories: d.c. research equipment, English Electric Co. Ltd.—Kearsley Substation: 132 kV switchgear, English Electric Co. Ltd.—Radstock Substation: two 45 MVA, 132/33 kV transformers, Ferranti Ltd.—Ealing Substation: 66 kV, 22 kV and multicore cables, British Insulated Callender's Cables Ltd.—Denham substation: two 45 MVA, 132/22 kV transformers, Hackbridge and Hewittic Electric Co. Ltd.—Reading Substation: 132 kV switchgear protection and connections, A. Reyrolle and Co. Ltd.—Eltham substation: two 45 MVA, 132/33 kV transformers, Brush Electrical Engineering Co. Ltd.—Wandsworth Substation: two 30 MVA, 132/11 kV transformers, Ferranti Ltd.; two 90 MVA, 132/66 kV transformers, Ferranti Ltd.—Wimbledon Substation: 132 kV switchgear, Associated Electrical Industries Ltd.—Pembury-Marden: overhead line works, Pirelli-General Cable Works Ltd.—Chesterfield Substation: 275 kV switchgear, General Electric Co. Ltd.—Gloucester Substation: 275 kV switchgear, Associated Electrical Industries Ltd.—Penwortham Substation: 275/132 kV switchgear, Associated Electrical Industries Ltd.—"Dame Caroline Haslett," cable-laying ship: modifications, Associated Electrical Industries Ld.—Grove Rd Substation: three 45 MVA transformers, Bonar, Long and Co. Ltd.; 132 kV switchgear, A. Reyrolle and Co. Ltd.—Elland Power Station: four 180 MVA transformers, C. A. Parsons & Co. Ltd.—Uskmouth Power Station: 400/275 kV overhead line, Associated Electrical Industries Ltd.—Trawsfynydd-Ffestiniog: pilot cables, London Electricity Board.—Elland Substation: 400/275 kV and 132 kV overhead lines, J. L. Eve Construction Co. Ltd.—Waltham Cross Substation: 275 kV switchgear, English Electric Co. Ltd.—Tilbury Substation: 132 kV cables, Enfield-Standard Power Cables Ltd.—Fleet Substation; two 60 MVA synchronous condensers, General Electric Co.

Lancs C.C. Rewiring of Hindley Green County Secondary School, G. Moss and Sons Ltd., £3,439; fluorescent lighting installation at Huyton (Westmorland Rd) Branch Library, Lee Beesley and Co. (Birmingham) Ltd., £263.

Newcastle upon Tyne C.C. Electrical work in Elswick Hall, A. F. Jemison Ltd., £1,274 12s.

Gazette Announcements

COMPANIES ACTS

W. J. Thompson (Electrical) Ltd. Mr T. H. Griffith, 28 Mackenzie St, Slough, appointed liquidator at extraordinary general meeting on 31 Aug. for the purpose of voluntarily winding-up.

Philip Greene Ltd. Last day for receiving proofs for intended dividend: 22 Sept., by liquidator: H. M. Arthur, 6 Cavendish Court, 11-15 Wigmore St, W.1.

Tone Electrical and Eng. Co. Ltd. Mr L. S. Daniel, Bridgwater Hse, Corporation St, Taunton, appointed liquidator at extraordinary general meeting on 5 Sept. for the purpose of voluntarily winding-up.

Murts Ltd. Resolution for voluntarily winding-up passed at extraordinary general meeting on 30 Aug. Mr A. J. Pope, 7 Alfred St, Bath, was appointed liquidator by subsequent meeting of creditors.

Audiovision (Electrical) Ltd. Creditors to send details to liquidator: S. J. Baker, 26-28 Finsbury Sq, E.C.2, by 30 Sept.

Neptric Ltd. and **Nortic Electrical Ltd.** Creditors to send details to liquidator: G. A. Weiss, 19 Eastcheap, E.C.3, by 30 Nov.

BANKRUPTCY ACTS

Dividends

High Court of Justice. L. G. Archer and R. N. Shaw, domestic appliance retailers, lately carrying on business as Paramount Vacuums and Electrics at 308 High St North, E.12, and formerly at 193 Plashet Rd, E.13. Dividend per £: 2½d, payable at Bankruptcy Bldgs, Carey St, W.C.2, on 27 Sept.

Macclesfield. C. Davies, electrical contractor, of 39 Moss Brow, West Bollington. Dividend per £: 8d, payable at 47 Mosley St, Manchester, on 26 Sept.

Guildford. G. R. Jacobs and C. J. Trevethan, television, radio and electrical appliance retailers, formerly carrying on business as Dean Electric Appliances, at 192 Stoughton Rd, Guildford, and 226 Connaught Rd, Brookwood. Dividend per £: 7d, payable at 6 Lee Pale Rd, Guildford, on 26 Sept.

TRADE NOTES

Changes of address. The Southampton branch of Walsall Conduits Ltd. has moved to 57-59 Castle Way. Telephone: Southampton 27161.

The registered office of the Eastern Regional Electrical Contractors' Association (India) Ltd. is now at Flat No. 3, 12/1a Lindsay St, Calcutta 16.

Optoshield Ltd. are transferring production and development departments to Watford, but the Sales Dept. and head office remain at 146 Clerkenwell Rd, E.C.1.

BEAMA Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in: *(a)* "Rates of Pay"—the rate of pay for adult male labour at 15 Sept., 1961, shall be deemed to be 213s 6d; *(b)* "Cost of Material"—the index figure for materials used in the Electrical Machinery industry at 15 Sept., 1961, is 119·0* (184·6*).

For Turbo-generating and Allied Plant. For purposes of calculating variations in: *(a)* "Rates of Pay"—the rate of pay for adult male labour as at 15 Sept., 1961, shall be deemed to be 213s 6d; *(b)* "Cost of Materials"—the index figure for materials used in the Mechanical Engineering Industry at 15 Sept., 1961, is 128·8* (193·5*). "Blast Furnace and Iron and Steel Melting and Rolling (1948 S.I.C. ref. 40/41)" 191·5. Other Steel Goods excluding tubes (1958 S.I.C. ref. 311/2), 130·5*. The price of brass condenser tubes ¾ in. o/d 18 s.w.g. on 15 Sept., 1961, is 4s 1½d per lb. *Provisional figure.

The figures in parentheses shown above relate to earliest list of wholesale price index numbers in which the year 1949 is taken as the base 100. For the other figures 1954=100.

Belfast depot. Thorn Electrical Industries Ltd. have opened a depot at 10 Severn St, Belfast 4, to handle group products. The depot manager is Mr R. A. Bibby.

New factory. Perdio Ltd. are to establish a factory at Pallion, Sunderland, for the manufacture of transistor radios and TV sets, and associated components.

Development. Under a £250,000 development plan for their Sheffield factory, Stanley Works (G.B.) Ltd. are to erect a 33,000 sq ft administration block, and add a new floor to one wing of the existing factory.

BUSINESS PROSPECTS

Anglesey. Budenberg Gauge Co. Ltd., Broadheath, Altrincham, plan new factory, Amlwch.

Belfast C.C. Tender: 59 dwellings, New Barnesley estate extensions; City Architect. Tender: alterations and extensions to Fane St Primary School; City Architect, 40 Academy St.

Birkenhead. Proposed: 14 shops/supermarket/flats, etc., Arrowe Pk estate, Woodchurch, for Sir Robert Lloyd and Co. Ltd., Bromborough, Ches.

Billingham. U.D.C. propose £100,314 shopping centre, Town Sq; architects: Elder and Lester, Midland Bank Chmbrs, Town Sq.

Boston. T.C. propose 58 dwellings, Woad Farm estate, to cost £79,300.

Bristol. Proposed: development on a six-acre industrial site, Whitchurch Airport, by John Harvey and Sons Ltd., Bristol. Contract, about £300,000 placed with Sir Robert McAlpine and Sons Ltd., 80 Park La, W.1, for warehousing buildings, Whitchurch. B.T.C., Area Offices, Bath Parade, propose new engineering depot, Bower Ashton.

Burnley. Planned: dance hall, off Yorkshire St, for Mecca Ltd., 76 Southwark St, S.E.1.

Camberley. War Dept. plan training school for women officers, Portsmouth Rd; cost: £627,000.

Cardiff. The Arlbee City Development Ltd. placed contract with Tersons Ltd., Dollis Pk, N.3, for shopping arcade/shops/offices, Hayes Bridge; cost: £346,352.

Castle Ward. John T. Bell and Sons, Market St, Chmbrs, Newcastle, propose housing development, Whorlton Grange estate.

Colne B.C. Tender: 94 dwellings, Lob Common. Engineer. Colne, Lancs.

Cuckfield. U.D.C. propose 200 flats, 16 houses, High St, Lindfield and Hickman's La; Clerk, Council Offices, Oaklands, Haywards Heath.

Dalkeith. Factory, 12,000 sq ft, proposed, Ramsay Croft, by Adams (Dalkeith) Ltd., Eskbank Rd.

Darlington. Shopping developments, Skinnergate/Duke St, proposed for W. Duncan Ltd., South Shields; architect: C. Solomon, 30 St. Mary's Pl, Newcastle. R.D.C. propose council chamber/offices, Uplands Rd; architect: R. Brown, 123 Victoria Rd.

Derby. 53 shops/hotel/office block, supermarket proposed by Main Centre (Derby); cost: £500,000; contractors: Gee, Walker and Slater Ltd., Uttoxeter Old Rd, Derby.

Devizes. Orchard and Peer, Bowbridge Wharf, Stroud, propose 125 houses, Roundhay Pk, Lady Anne Cowdray, Broadleas, Devizes, proposes 30 houses, Broadleas.

Durham. K. Gradon, Whitesmicks, North End, proposes shops/offices, North Rd.

Edgware. 14-storey block, shops/offices, The Goods Yard, Station Rd, to be erected by Wates Ltd., 1258 London Rd, S.W.16; promoters: Churchgate Property Co. Ltd.; cost: £400,000.

Edinburgh C.C. Tender: 157 houses, Leith Fort development; City Architect.

Glasgow. Proposed: scheme for 570 dwellings, Bellahouston Pk, and further 400 houses, Albion track development; architects: Miller and Black, Glasgow. Brunswick Bowling Ltd. propose £250,000 bowling alley, Cumming Dr, Somerville Dr. Boswell, Mitchell and Johnston, 256 West George St, C.2, architects for proposed 114-bed maternity unit, Royal Samaritan Hospital; cost: £560,000. £2 million scheme proposed by Grampian Holdings Ltd., 124 St. Vincent St, C.2, for 20-storey air terminal, heliport and hotel, Gorbals. Proposed: 20 new factories on 35-acre site of "Dixon's Blazes" steelworks, Hutchesontown; promoters: Taylor Woodrow Industrial Estates Ltd.; cost of buildings about £3 million; plant installations to cost about £8 million.

Golbourne U.D.C. Tender: 30 traditional houses, Oaklands Rd, Lowton; Engineer.

Hampshire. C.C. propose ambulance station, New St, Lymington, and primary school, Burton Hall, Christ Church East; County Architect, Winchester. C.C. proposes new county secondary girls' school to accommodate 600, Purbrook.

Harpenden. Shops/offices, Arden Grove, proposed by County and Central Properties Ltd.; cost: £80,000; architects: Ian Fraser and Assoc., 15 Bedford St, W.C.2.

Hastings C.B.C. Tenders by 26 Oct. for new grammar school for 570 pupils; Surveyor.

Hemel Hempstead. Proposed: stationery dept., Belswains La, for John Dickinson Ltd.; company's architects; cost: £750,000.

Huddersfield C.B.C. Tender: new civic centre, phases I and II. Architect.

Leeds. Conversion of Clifton Cinema, Stanningly Rd, Bramley, into warehouse/timber store/offices proposed by Forest Products, Leeds, Ltd., Yorkshire Post Bldgs, Albion St. C.C. propose new R.C. secondary school on the Leeds-Bradford Rd, adjoining Toad's Hole Wood.

Leics. C.C. propose new City of Leicester boys' school; cost: £263,835; City Architect. Tender: Major alterations/extensions to Ibestock Secondary Modern School; County Architect, London Rd, Leicester.

Leyburn R.D.C. Tender: 22 traditional dwellings, Middleham and Newton-le-Willows; Surveyor, Leyburn.

Liverpool. University authorities plan academic building for the Dept. of Electrical Engineering, Crown St.

London. Five-storey factory premises, Bethnal Green Rd, Club Row, E.2, proposed by E. M. Hyams and Co. Ltd., 246 Goswell Rd, E.C.1; architect: M. Sanders, 24 Harley St, W.1. Constitutional Club/offices/Spiritualist church planned in 15-storey development, Balham High St, S.W. Proposed: new Berners Hotel, Berners St, Oxford St, W.1; architects: Fitzroy Robinson and Ptnrs., 3 Gray's Inn Sq, W.C.1. 16-storey block, offices/flats proposed, Connaught St, Paddington, W.2; Ronald Ward and Ptnrs., architects, 29 Chesham Pl, S.W.1. B.B.C., Portland Pl, W.1, plan technical accommodation, etc., at television centre, Wood La and Shinfield St, Hammersmith, W. Proposed: seven-storey office block at 22-24 Berners St, W.1, to cost £146,000; contractors: H. Fairweather and Co. Ltd., St. James's La, N.10.

Luton. N.W. Metropolitan Hospital Board, 40 Eastbourne Terr, W.2, propose £100,000 extensions to Luton Maternity Hospital; Regional Architect.

Macclesfield. Chamberlain Group, 3 Buckingham Palace Gdns., S.W.1, plan factory, Hurdsfield industrial estate, for Johnson's of Hendon Ltd. New factory planned on land near Brook St by Locomotors Ltd., Elevator Rd, Trafford Pk, Manchester.

Manchester. Showrooms / offices / bank, Queen's Hotel, proposed by Queen's Hotel (Manchester) Ltd., Portland St.

Margate. Planned: supermarket/shops, Station Rd, Birchington, for Elliott, Son and Boyton, surveyors, 86 Wimpole St, W.1.

Middlesbrough T.C. propose 126 dwellings, Easterside site. Engineer.

Midlothian C.C. Tender: 27 traditional dwellings and a shop, Pumpherston; County Architect, 32 Palmerston Pl, Edinburgh.

Milford Haven. Permission granted for £11 million plants projected by Esso Ltd. and Fisons Ltd.

Newbury. B.C. propose modernisation of 107 council houses, Monks La. Surveyor.

Newcastle. C.C. award £782,000 tender for two 20-storey blocks of flats to Leslie and Co. Ltd., Woodland Rd, Darlington. L. J. Couves and Ptnrs., Grainger Chmbrs, Hood St, architects for proposed new girls' grammar school for Convent of Sacred Heart.

New Malden. Proposed: Extensions to printing works of Bradbury Wilkinson and Co. Ltd., West Barnes La; contractors: Sir Robert McAlpine and Sons Ltd., Park La, W.1; cost: £220,000.

Northampton C.B.C. Tender: New secondary modern school for boys, Cliftonville Rd; Chief Education Officer.

North Riding C.C. considering tenders for country school, The Avenue, Nunthorpe. County Architect, Northallerton.

Norwich. Proposed at St. Stephen's St, large retail store/supermarket/22 shops/offices; promoters: Norwich Union Insurance Socs., of Norwich; joint architects: G. S. Buckingham and R. O. Bond, 29 Tombland, Norwich, and T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1; cost: £1,500,000. Shingler and Risdon, 47 Bedford Row, W.C.1, architects for Proby Investments Ltd. redevelopment of Heigham Hall, including a motel/ballroom/stores/shops/two ten-storey flats.

Nottingham. Printing works, Wigman Rd, Bilborough, proposed for Tom Brown and Co. (Nottingham) Ltd.; contractors: John Laing and Son Ltd., Mill Hill, N.W.7.

Oban. Herring processing plant proposed for Marinpro Ltd., 11 Pudding La, E.C.3.

Oldbury. New bar mill, cost £500,000, planned for London Wks (Barlows) Ltd., Halesowen St; consulting engineers: Bylander, Waddell and Ptnrs., 169 Wembley Park Dr, Wembley.

Oxford. The Senate plan stage one of new science precinct, Keble Rd, to cost about £1,000,000; consulting engineers: Ove Arup and Ptnrs., 13 Fitzroy St, W.1.

Perth. Proposed by General Accident, Fire and Life Assurance Corpn. Ltd., High St, first phase of a £500,000 project for office extensions at Tayside, Isla Rd; contractors for this stage, to cost £175,000, Charles Gray (Bldrs) Ltd., 4 Francis St, Dundee.

Ramsey. U.D.C. propose housing estate, Station Rd; Surveyor.

Rochdale. Proposed: St. Wilfrid's secondary modern school, for Salford R.C. Trustees, Wardley Hall, Swinton.

Rothbury. J. H. Napper and Ptnrs., 133 Osborne Rd, Newcastle, architects for proposed new school for Governors of St. Thomlinson's C.E. School.

Salisbury. C.C. award £116,307 contract for 77 dwellings, Essex Sq, to John Pritchard Ltd., Avon Terr.

Sheffield. Proposed: £5 million comprehensive redevelopment scheme for Sheaf Valley. Promoters, Estate Property Investment Co. Ltd. Architects, Marsh and Woolf, 3 Old Barrack Yd, S.W.1.

Southampton. C.E.G.B. propose engineering lab, synchronous condenser house, offices, etc., Marchwood power station. B.C. propose 667 dwellings in amended programme and 33 flats in three blocks, site of Crabwood Farm; Engineer.

South Shields C.B.C. Tender: 129 houses, Whiteleas estate; Engineer. Proposed: factory premises, Maxwell St, for Harlow Printing Wks (Northern) Ltd.; architect: C. Solomon, 30 St. Mary's Pl, Newcastle. Factory, Simonside, Newcastle Rd, proposed for Industrial Estates Management Corpn.; architects: Jack Cotton, Ballard and Blow, Haymarket Hse, Newcastle.

Spennymoor. Industrial Estates Management Corpn., Team Valley estate, Gateshead, propose factory additions to plans by C. S. Errington, 46 Grainger St, Newcastle.

Stockport. Proposed: industrial premises, Newbridge La, for Cornbrook Chemical Co. Ltd., Millgate.

Stoke-on-Trent. Town and City Properties Ltd., Kingsbury Hse, King St, S.W.1, propose £500,000 shopping centre at Longton; architects are Ian Fraser and Assoc., 15 Bedford St, W.C.2.

Sunderland. G. T. Brown and Son, 14 Grange Tce, Stockton Rd, architects for Durham Division Coal Board proposed five-storey offices, Thornhill Park. B.C. propose two youth centres, costing £80,000 and also special school, Redcar; Architect, Stockton Rd. C.B.C. Tender: 137 dwellings, various sites; Architect, Stockton Rd. T.C. propose 1,200 houses during 1962; Architect.

Swansea. Sir Percy Thomas and Son, 104 Walter Rd, architects for factory, Gorseinon, for Minnesota Mining and Mnfg. Co. Ltd., Penllergaes, Gorseinon.

Business Prospects—continued

Twickenham. Bernard Gold and Ptnrs., 4 Savile Row, W.1, architects for ten-storey offices/public house, London Rd and Park Rd; promoters: Centrovincial Estates Ltd.

Walsall. M.o.W. propose development of land, Willenhall La, for Post Office technical engineering centre. Tenders next month for West Midlands Teachers' Training College, to cost £600,000; architects: Richard Sheppard, Robson and Ptnrs., 5 Southampton Pl, W.C.1.

Watford. Proposed: two-storey extension to main factory at Lower High St for Ever Ready Co. (G.B.) Ltd.; contractors: R. F. Peachey and Sons Ltd., Hornefield Church La, Tottenham, N.17.

Wembley. Contract placed with Haymills (Contractors) Ltd., Exhibition Grounds, Wembley, for £100,000 factory for Johnson, Matthey and Co. Ltd., 78 Hatton Gdn, E.C.1.

West Ashford. Motel proposed by Courage and Barclay Ltd., Medway Brewery, Maidstone.

West Hartlepool. B.C. issuing tenders for first stage of college of further education; A. G. Sinclair, Borough Architect.

Weston-super-Mare B.C. Tender: 88 dwellings, Oldmixon development site; Clerk.

Whickham. J. H. James and Son, builders, Archer St, Wallsend, propose 46 houses, Dunston Rd.

Whitley Bay. John T. Bell and Sons, Market St, Newcastle, propose to develop land, Hills Head Rd.

Wideopen. Tasker and Ptnrs., 25 New Bridge St, Newcastle, architects for proposed Presbyterian church.

Wigan. Factory extensions proposed for A. T. and E. (Wigan) Ltd., Pioneer Wks, Ormskirk Rd.

Willenhall. Offices to cost £100,000 planned for Ductile Steel Group; architects: J. F. Phillips and Assoc., 36 New St, West Bromwich.

Winchester. Industrial estate on former gas works site, Winnall, proposed by Ronald Lyon (Estates) Ltd., Hersham.

MEETINGS TO NOTE

THURSDAY, 21 SEPT.

SOCIETY OF INSTRUMENT TECHNOLOGY (Grangemouth). "Theoretical Aspects of Control Engineering," J. M. Keating, Leapark Hotel, Bo'ness Rd. 7 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Radio Spectroscopy Group). Conference on Radio-spectroscopy of Solids at University College of North Wales, Bangor, until 22 Sept.

MONDAY, 25 SEPT.

INSTITUTION OF PLANT ENGINEERS (W. and E. Yorks). "The Construction of Bradwell Heat Exchangers," J. Shaw and G. Cain, Houldsworth School of Applied Science, Leeds University. 7.30 p.m.

I.E.S. (Birmingham Centre). Chairman's address, S. C. Dinenage, Chamber of Commerce, 75 Harborne Rd, Edgbaston, Birmingham 15. 6.30 p.m.

A.S.E.E. (Bournemouth and District). "Modern Trends in Electrical Water-heating," L. L. Hughes. The Grand Hotel, Firvale Rd. 8 p.m.

A.S.E.E. (N.W. London). "Electro-magnetic Drives," J. B. Bailey. Compass Hotel, Watford. 8.15 p.m.

TUESDAY, 26 SEPT.

BRITISH INSTITUTION OF RADIO ENGINEERS (Southern Section). Chairman's address, "Lightning—Facts and Fancies," W. A. Gambling. Technical College, Farnborough. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY. "Underground Gasification of Coal—Some Features of Instrumentation," Dr A. E. Balfour. "Trends in Mining Instrumentation," A. E. Bennett. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

I.E.S. (Leicester Centre). Chairman's address, H. R. Ruff. Demontration Theatre, East Midlands EB. Charles St. 6.15 p.m.

A.S.E.E. (Oxford and Districts). "Fluorescent Lighting Circuits: Installation and Fault-finding." Aylesbury Technical School. 7.30 p.m.

FIRST INTERNATIONAL HEATING, VENTILATING AND AIR CONDITIONING EXHIBITION at Olympia until 6 Oct.

WEDNESDAY, 27 SEPT.

BRITISH INSTITUTION OF RADIO ENGINEERS (Education and Training Committee). Symposium: "The New Graduateship Syllabus and the Institution's Recommendations for Practical Training." University College, W.C.1. 10.30 a.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Television Group). "Some Recent Developments in Television Tape Recording," P. E. Axon, K. Machein, A. Harris. London School of Hygiene and Tropical Medicine, Keppel St, Gower St, W.C.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (West Midlands Section). "The Single Crystal Circuit," D. H. Roberts, College of Technology, Wolverhampton. 7.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Yorks). One day symposium, "New Techniques in Primary Measuring Methods," Kenwood Hall, Sheffield 7.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Wales). "Analytical Instruments for Process Control," E. J. West, Welsh College of Advanced Technology, Cathays Pk, Cardiff. 6.45 p.m.

BRITISH CONFERENCE ON AUTOMATION AND COMPUTATION. "Mathematics—Friend or Foe?" Dr D. G. Christopherson. I.E.E., Savoy Pl, W.C.2. 5.30 p.m.

A.S.E.E. (Portsmouth and District). "The Application of Epoxide Resins in Industry," T. S. Gray. Royal Air Force Association Club, Cosham. 7.30 p.m.

THURSDAY, 28 SEPT.

SOCIETY OF INSTRUMENT TECHNOLOGY (Chester). "Our Technology and Our Society," G. C. Elteneton. Stanley Palace, Watergate St. 7 p.m.

PURCHASING OFFICERS' ASSOCIATION. "Minibition" at Brighton until 30 Sept.

INSTITUTION OF PLANT ENGINEERS (Sheffield). "Industrial Relations," W. Carron. Grand Hotel. 7.30 p.m

A.S.E.E. (N. Ireland). "Subscriber Trunk Dialling," T. S. Wylie. Central Hall, Rosemary St, Belfast.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Electronics Group). Conference on the Physics of Gas Discharge Devices at Leamington Spa until 29 Sept.

FRIDAY, 29 SEPT.

INSTITUTION OF PLANT ENGINEERS (Birmingham). "The Planning, Application and Maintenance of Industrial Lighting," V. Heydon. Imperial Hotel, Temple St. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Scottish). "A Chemical Engineer Looks at Instruments for a Chemical Plant," J. G. Sloan. Scottish Building Centre, Sauchiehall St, Glasgow. 7.15 p.m.

I.E.S. (Glasgow Centre). Luncheon Meeting. Grand Hotel, Charing Cross. 12.30 p.m.

A.S.E.E. (Coventry and District). "Load Tanks for Testing Large Alternators," G. Dawson. Conservative Rooms, 16 Queen's Rd. 8 p.m.

A.S.E.E. (Stoke and Crewe). "Static Switching Control," B. A. W. Midgley. Royal Hotel, Crewe. 7.30 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Abacus. 821,829. Class 11. Ceiling light diffuser panels, etc. Morriss Research Design Ltd., 8a Westminster Rd, W.7.

Apolec. 822,801. Class 9. Transistorised and battery operated tape recorders. Northgate Traders (City) Ltd., 11a Wormwood St, E.C.2.

Autoclor. B810,203. Class 9. Devices for automatically measuring and dispensing predetermined quantities of chemicals into water feed pipes. Gilliam and Co. Ltd., 902 Purley Way, Purley.

Brigand. 820,782. Class 9. Batteries, etc. Berec Radio Ltd., Hercules Pl, N.7.

Climatronic. 821,624. Class 9. Electric regulating apparatus for automatically controlling temperature, etc., in fuel combustion apparatus. Rheostatic Co. Ltd., 94 Farnham Rd, Slough, Bucks.

Duchess Hair Dryer in design. 821,092. Class 11. Mitcham Mnfg. Co. Ltd., 192-194 Kensington Church St, W.1.

Forksichord. 819,619. Class 9. Instruments incorporating tuning forks for testing vibratory frequencies. Westrex Co. Ltd., 152 Coles Green Rd, N.W.2.

Prismalipse. 817,129. Class 11. Light fittings. Loblite Ltd., Third Ave, Team Valley, Gateshead 11.

Protimeter Concretemaster, Protimeter Paintmaster and **Protimeter Timbermaster.** 816,994, 5 and 6. Class 9. Meters, measuring and testing apparatus, etc. Gallwey Chemical Co. Ltd., Fieldhouse La, Marlow, Bucks.

Quersa. 821,171. Class 7. Portable power-operated hand tools, etc. S.P. Mercantile Ltd., 39-47 East Rd, N.1.

Ray-o-Vac in design. 811,733. Class 9. Dry cells, batteries, etc. 811,736 and 811,734. Class 11. Torches. Electric Storage Battery Co., 2 Penn Center Plaza, 15th St and Pennsylvania Boulevard, Philadephia, U.S.A.

RS in design. 808,853. Class 9. Apparatus, etc. Radiospares Ltd., 4-8 Maple St, W.1.

Stratacon. 821,051. Class 9. Apparatus, etc. Painton and Co. Ltd., Bembridge Dr, Kingsthorpe, Northampton.

Tudormatic. 821,121. Class 7. Machines for domestic use. Tudormatic (Domestic Appliances) Ltd., 8-10 Mathew St, Liverpool.

Turnamat. 818,818. Class 7. Washing machines. A.E.G., 150, Hohenzollerndamm, Berlin-Grunewald, Germany.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Ashley Effects Ltd., 40 Portland Pl, W.1. Manufacturers and factors of fibre mouldings and artificial effects for electric fires and oil heaters, etc. Nom. cap.: £100. Dirs.: Michael J. Montague, Peter Belak, Charles E. Bently-Stevens and Norman H. Davis.

K. Blundell (Southport) Ltd., 32 Forest Rd, Southport, Lancs. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Kenneth Blundell and Mrs Barbara Blundell.

Bruno Electrical Ltd., 89 Solihull Rd, Shirley, Solihull. Manufacturers of and dealers in general electrical and other equipment, etc. Nom. cap.: £1,000. Dirs.: Walter G. Jakeways and Edith Jakeways.

Consolidated Electrodynamics Corporation (U.K.) Ltd., 11 Old Jewry, E.C.2. Nom. cap.: £10,000. Dirs.: to be appointed by subs. Subs.: John W. Scott and John D. Campbell.

Homevac Electrics Ltd., 5-7 Walcot St, Bath. To take over the business of dealers in domestic appliances carried on as "Homevac Electrics" at Bath, etc. Nom. cap.: £1,000. Dirs.: William C. Walton and Mrs Patricia Walton.

Ranco Controls Ltd., 15 Bedford Row, W.C.1. To acquire part of the undertaking of Ranco Ltd. (incorporated in Scotland), etc., and to carry on the business of manufacturers of and dealers in thermostatic and pressure controls, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Terence J. Tilley and David Spencer.

T. and M. Robertson Ltd. Designers, makers and hirers of sensing, measuring, transducing, transmitting, control and power devices, etc. Nom. cap.: £2,000. Dirs.: to be appointed by subs. Subs.: T. Robertson, 138 Bishopton Rd, Stockton-on-Tees; and Mark Robertson, 102 Coniscliffe Rd, Darlington.

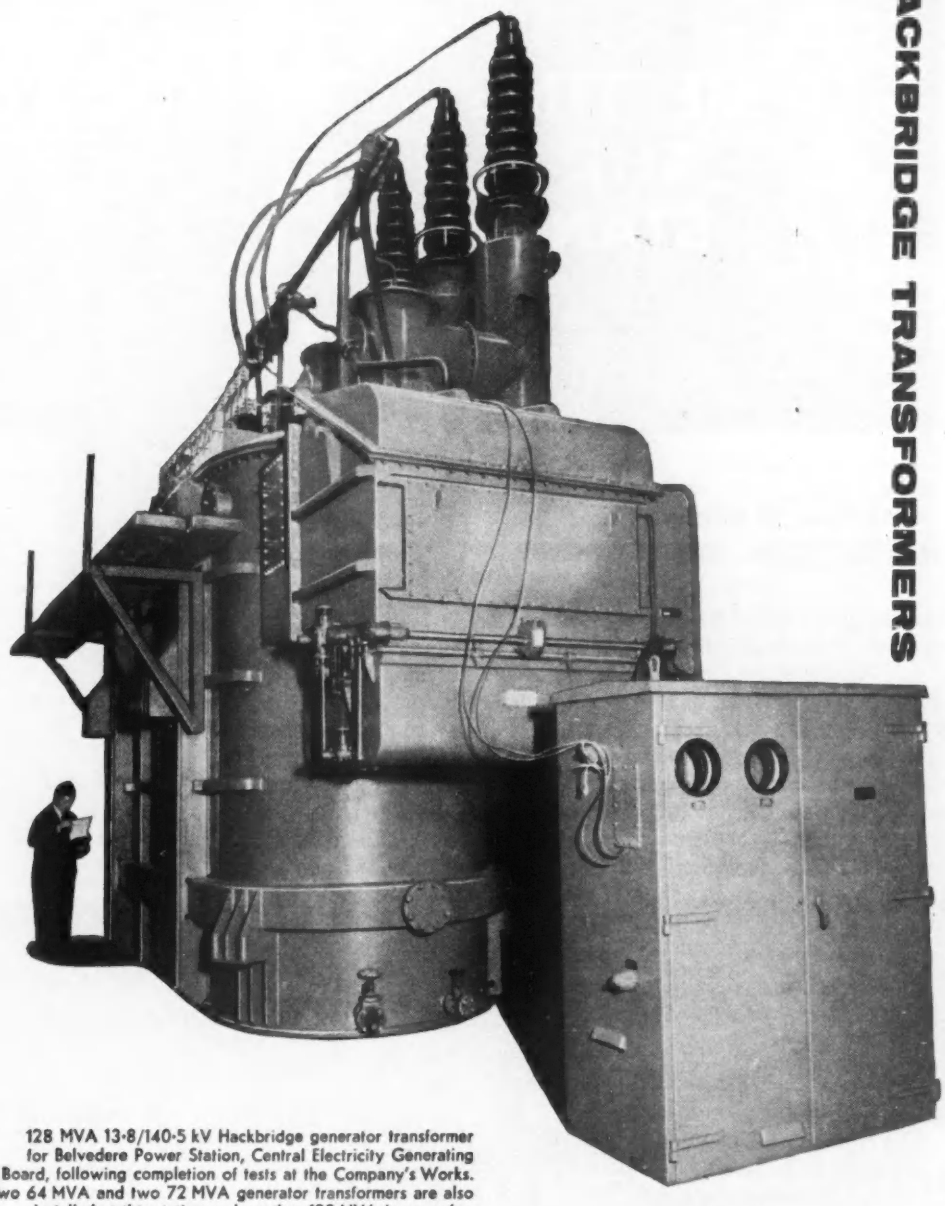
S.A.Y. (Electrical) Ltd., 5 High St, Romford, Essex. Nom. cap.: £100. Permanent dirs.: Reginald R. Scott, David W. G. Adams, Richard Adams and Peter Yates.

Spalding and Kidd Ltd. Electrical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Dorothy M. Graeme and Paul G. Graeme, 61 Fairview Ave, Gillingham, Kent.

Swarealm Electrical Co. Ltd. Nom. cap.: £100. Electrical engineers, etc. Dirs.: to be appointed by subs. Subs.: Jean Herbert and Thomas A. Herbert, 156 Strand, W.C.2.

Trimbee and Barnes Ltd., 19-23 Ludgate Hill, E.C.4. Electrical engineers, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Robbie Burns and Maxine Karger.

HACKBRIDGE TRANSFORMERS



128 MVA 13·8/140·5 kV Hackbridge generator transformer for Belvedere Power Station, Central Electricity Generating Board, following completion of tests at the Company's Works. Two 64 MVA and two 72 MVA generator transformers are also installed at this station and another 128 MVA is on order.

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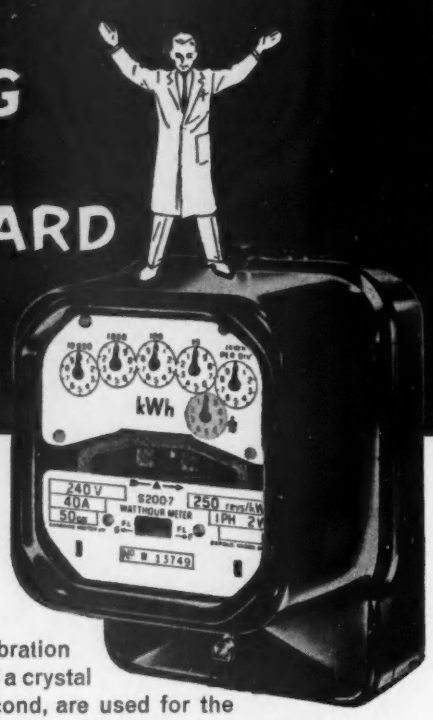
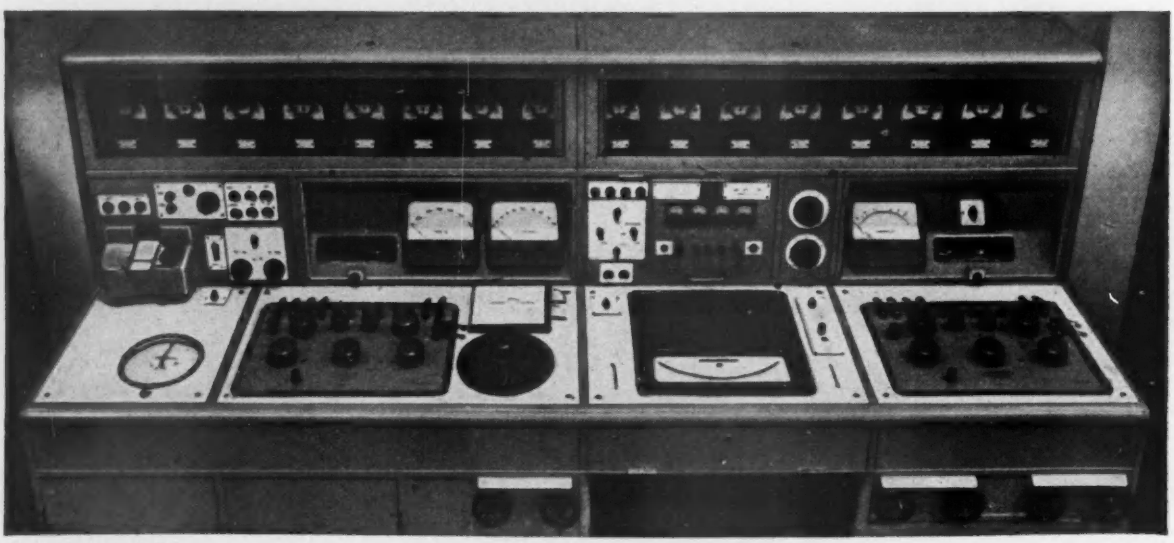


MODEL S 200 STANDARDISATION EQUIPMENT

The Standardisation Bench is the heart of the electronic testing equipment which ensures extreme accuracy of calibration of all S 200 meters. A Laboratory Standard Wattmeter and a crystal controlled electronic timer, reading to 1/10th of 1 millisecond, are used for the daily checking of the Rotating Standard. d.c. potentiometers are installed for the regular checking of the Laboratory Standard Wattmeter.
A large Rotating Standard dial presents the average speed of 4 very closely checked Standard Meters. Separate sets of four Standard meters being maintained for each of the various frequency ranges in which meters are supplied. The Standardisation Bench is used to check the Master Meter in each control unit in the final calibration line.



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CLASSIFIED ADVERTISEMENTS

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NORTH RIDING OF YORKSHIRE COUNTY COUNCIL

TENDERS invited for lighting a traffic roundabout at Ormesby, A174. Apply for documents to County Surveyor, County Hall, Northallerton, Yorks. Tenders due: 16 Oct., 1961. (C 135)

CITY AND COUNTY BOROUGH OF BELFAST ELECTRICITY DEPARTMENT

TENDERS are invited for the supply, delivery and erection of:

V.H.F. Fixed and Mobile, Frequency-Modulated, 25 kc/s Channel Spacing, Radio Telephone Communication Equipments.

Form of Tender and Specification (No. W.199) may be obtained at the Electricity Department, East Bridge St, Belfast 1, on payment of a deposit of £2 2s which amount will be refunded provided a bona-fide Tender is lodged and not withdrawn. Extra copies may be obtained at £1 1s each, which sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each Tender, in sealed envelope marked "Tender for Radio Telephone Communication Equipments, Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 13 Oct., 1961.

An official receipt must be obtained for each Tender delivered by hand. Tenders sent by post should be registered.

The lowest or any Tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast 1.
P.O. Box 234. (C 160)

APPOINTMENTS VACANT

SOUTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER

WEST CORNWALL

SALARY within Class G, Grade 11, Salary Scale 5, £825/£940 per annum of the N.J.B. Agreement.

The successful candidate will be primarily responsible to the First Assistant District Engineer (Construction) for duties in connection with supervision of the erection of overhead lines and/or underground cable laying. He may also be required to undertake other general engineering duties, including standby.

Possession of the Higher National Certificate in Electrical Engineering is desirable and the ability to drive a car will be an advantage.

Applications for this post to be made on standard form AE6/ACT OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 13 Basset Rd, Camborne. Closing date for receipt of completed applications is 7 Oct., 1961. (C 151)

SOUTH EASTERN ELECTRICITY BOARD

STORES SUPERVISOR

EASTBOURNE DISTRICT

APPLICANTS should possess good knowledge of electrical engineering stores and equipment, have organising ability and be capable of controlling staff. A knowledge of purchasing and stores procedures is necessary. Salary £780 per annum rising to £880 p.a Superannuable.

Applications, quoting ET and naming two referees to District Manager, Seeboard, Electric Hse, Grove Rd, Eastbourne, by 4 Oct., 1961.

GEORGE WRAY,
Secretary.
(C 150)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT PLANNING ENGINEER

STAYTHORPE "A" AND "B" POWER STATIONS

Vacancy No. 210/61.

APPLICATIONS are invited for the position of Assistant Planning Engineer at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training.

Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary date for receipt of applications: 29 Sept., 1961.

ASSISTANT INSTRUMENT ENGINEER

STAYTHORPE "A" AND "B" POWER STATIONS

Vacancy No. 211/61.

Applications are invited for the position of Assistant Instrument Engineer at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Applicants should have had sound training and wide experience in instrument making and/or repair. Preference will be given to candidates with knowledge of electronic and other modern forms of instrumentation and complex control systems as encountered in modern power stations or other large industrial organisations.

Salary will be in accordance with Class M, Grade 9 (£1,350/£1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 29 Sept., 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
8 Sept., 1961. (C 154)

SOUTHERN ELECTRICITY BOARD

Yeovil District of No. 4 (Bournemouth) Sub-Area

ASSISTANT ENGINEER (PLANNING)

SALARY N.J.B. Class G, Grade 9 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The successful candidate will be required to assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in Electricity Supply Distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, Hants, and returned to him, quoting Z.1392, not later than 2 Oct., 1961. (C 149)

YORKSHIRE ELECTRICITY BOARD

Head Office

SECOND ASSISTANT ENGINEER

DISTRIBUTION DESIGN (MAINS)

APPLICATIONS are invited for the above position in the Chief Engineer's Department at the Board's Head Office.

Applicants must have had extensive experience in the design and construction of overhead lines for voltages up to and including 66 kV and be fully conversant with the relevant Regulations and Standards.

Salary: N.J.B. Class K, Grade 5 (Scale 14) within the range £1,415/£1,720 per annum. The commencing salary will be dependent upon qualifications and experience.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Scarcroft, Leeds, not later than 6 Oct., 1961. (C 153)

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

ASSISTANT HEALTH PHYSICIST

required at

HINKLEY POINT NUCLEAR POWER STATION

THE Central Electricity Generating Board invite applications for the post of Assistant Health Physicist at the Hinkley Point Nuclear Power Station at Bridgwater, Somerset.

This post embraces practical and administrative responsibilities in the field of radiological protection. A wide range of varied problems may be anticipated as the Health Physics Department provides a comprehensive station monitoring service together with an extensive District Survey Programme.

Applicants should preferably possess an appropriate degree or qualification. Previous experience in Health Physics would be an advantage but is not essential as the successful applicant will be given a course of training.

Salary will be within the N.J.B. Class O, Grade 7, Scale 16, £1,795/£1,950 p.a. Superannuation Scheme.

Application should be made on form AE6/ACT, available from Divisional Secretady, Western Division, 26 Oakfield Rd, Clifton, Bristol 8, to be returned by 3 Oct., 1961, quoting reference ET/AV/89/61. (C 148)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position in the Board's Western District. The successful applicant will be based at 154 Uxbridge Rd, Shepherds Bush, W.12, but will be required to work anywhere in the District.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum rising to £1,215 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address, within 14 days of the publication date of this notice. Please quote ref.: PER/V/3223/T. (C 137)

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER

REQUIRED in the Wellington District of the Shropshire and Herefordshire Area.

Applicants should have had a sound technical training and experience in construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable.

Salary: £890/£1,015 per annum (N.J.B. Grade F.9). Superannuable.

Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr W. Winwood, Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

F. W. CATER,
Secretary.
(C 136)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

DUNGENESS NUCLEAR POWER STATION

INSTRUMENT ENGINEER

Staff Vacancy No. 240/61.

APPLICATIONS are invited for the appointment of Instrument Engineer at Dungeness Nuclear Power Station.

The successful candidate will be responsible to the Maintenance Superintendent for the routine maintenance and testing of all the instrumentation associated with the power station. Initially, he will be required to organise the work of his section and prepare planned maintenance programmes for a wide variety of physical and electronic instruments. He should be capable of critically assessing the performance of the instrumentation and associated control systems and of advising on the effectiveness of this performance in relation to the operation of the station.

Applicants should possess qualifications of degree standard or its equivalent, should have had experience of the control of labour and of the administrative direction of a technical section.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Schedule A, Class N, Grade 6, £1,795/£1,950.

Applications giving age, qualifications, experience, etc., should be addressed to:

The Personnel Officer, Central Electricity Generating Board, South Thames Division, Lower Ham Rd, Kingston upon Thames, Surrey, to arrive by 11 Oct, 1961. (C 132)

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

SENIOR ASSISTANT ENGINEER

(DISTRIBUTION DESIGN)

APPLICANTS must have had considerable experience in the design of extensive underground and overhead distribution systems operating at high and medium voltage. They must be capable of taking administrative control of the Sub-Area Distribution Design Section.

Salary: N.J.B. Class L, Grade 4 (Scale 16), £1,795/£1,950 per annum.

FOURTH ASSISTANT ENGINEER

(DRAUGHTSMAN)

Applicants should have had experience in cartographical and mains record work. Knowledge of surveying, subsequent plan preparation, together with some experience in the preparation of schematic and other electrical diagrams, will be an advantage.

Salary: N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 6 Oct., 1961.

No. 6 (Hull) Sub-Area

THIRD ASSISTANT ENGINEER

(METERS, TESTING AND PROTECTION)

Applicants should have good general and technical education with subsequent experience in the testing and maintenance of protective gear.

The duties will include commissioning, testing and maintenance of protective gear, the testing of electrical plant and equipment, cable fault location and general electrical testing throughout the Sub-Area.

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 6 Oct., 1961.

No. 3 (Sheffield) Sub-Area

SHEFFIELD DISTRICT

ASSISTANT ENGINEER (CONTRACTING)

Applicants should have had experience in estimating, tendering for and supervising electrical installation work, and in preparing specifications, either with a Supply Authority or a firm of electrical contractors.

Salary: N.J.B. Class L, Grade 11 (Scale 9), £1,115/£1,245 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 6 Oct., 1961.

No. 7 (Grimsby) Sub-Area

SCUNTHORPE DISTRICT

CONSUMERS' ENGINEER

(GENERAL DEVELOPMENT)

Applicants should have extensive experience of the General Development of Electricity Supplies, including responsibility for Service Centres and sales staff.

Salary: N.J.B. Class G, Grade 8 (Scale 8), £1,040/£1,165 per annum.

GENERAL ASSISTANT ENGINEER

(DRAUGHTSMAN)

Applications are invited for the post of Draughtsman (either Electrical or Building and Civil Engineering) in the Sub-Area Drawing Office. The successful applicant will be required to assist in the Drawing Office on work which includes building drawings, electrical diagrams and records.

Salary: N.J.B. either Class K, Grade 16 (Scale 3), £715/£805, or Class K, Grade 15 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 6 Oct., 1961. (C 152)

GAMBIA

ELECTRICAL ENGINEER

QUALIFICATIONS: A.M.I.E.E.

Duties. To take charge of the Gambia Electricity Department.

Emoluments (including gratuity): in scale £2,167/£2,530 per annum, according to experience.

Terms of appointment: Contract for one or two tours of 12-24 months.

Free passages. Education allowances up to £200 per annum per child. Apply Director of Recruitment, Department of Technical Co-operation, Carlton House Terr, London S.W.1. Give full name and brief details of age, qualifications and experience. Quote BCD.145/12/01/D10. (C 145)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER

(INDUSTRIAL DEVELOPMENT)

COMMERCIAL DEPARTMENT

AREA BOARD HEADQUARTERS

APPLICANTS should be well experienced in the applications of electricity to a wide range of industrial processes. Duties include developing new uses for electric power; preparation of technical information sheets; organising demonstrations of industrial equipment; lectures to audiences of engineers and co-operation with Sub-Area and District personnel engaged on technical sales.

The possession of appropriate technical or professional qualifications will be an advantage.

Salary scale: £1,750/£2,085 p.a. Grade K.2. N.J.B. conditions.

Applications on forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 9 Oct., 1961.

DEMONSTRATOR

LEIGH DISTRICT

Applicants should be qualified to lecture and advise on the utilisation of electric cookers, washing machines, refrigerators and other domestic appliances and to give public demonstrations in Service Centres and at exhibitions. Applicants should possess the E.A.W. Certificate.

Salary scale: £600 x £25—£700 p.a. Grade 1. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 2 Oct., 1961.

SUB-AREA SENIOR DEMONSTRATOR

SUB-AREA COMMERCIAL DEPARTMENT

BLACKBURN

Applicants should possess a recognised qualification in electrical housecraft **and** have had several years' experience in sales and demonstration work.

Duties will include contacting Education Authorities, women's organisations, etc.

The successful applicant will be expected to conform to the hours of duty applicable to Sales Staff.

Salary scale: £780 x £25—£880 p.a. Grade 3. N.J.C. conditions.

SENIOR DEMONSTRATORS

BURNLEY AND ROCHDALE DISTRICTS

Applicants must have a good knowledge of electrical appliances and be competent to give demonstrations and lectures in public halls, Service Centres and on consumers' premises.

The successful applicant will be required to assist in general service centre duties during normal hours of business.

Salary scale: £700 x £25—£775 p.a. Grade 2. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, and returned to him by 2 Oct., 1961. (C 140)

OVERSEAS

AIR MINISTRY WORKS DEPARTMENT

requires

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

under 35 years of age to fill posts in

GERMANY, MALTA, CYPRUS, ADEN, SINGAPORE

on tours of two or three years duration with continuing employment on return to the United Kingdom.

SALARY: £991 (age 25) to £1,490 (maximum) per annum, plus

FOREIGN SERVICE ALLOWANCE varying, at present, up to £1,310 p.a., according to location.

QUALIFICATIONS: At least the qualifying examination for corporate membership (or exemption) of the Institution of Electrical Engineers or the Institution of Mechanical Engineers (with appreciable electrical engineering experience) and not less than two years professional experience.

PROSPECTS: Excellent opportunities of obtaining permanent pensionable posts and of promotion to higher grades with salaries up to £3,715 p.a.

Write for details to Air Ministry Works Department (W.G.d./BK), Lacon Hse, Theobalds Rd, London W.C.1. (C 129)

ELECTRICAL SALES ENGINEER

(A.M.I.E.E. at least)

A new appointment to promote the use of aluminium foil and strip in transformer and magnet windings as well as other applications, requires a man over 30 years of age with sales experience and a knowledge of winding designs. The appointment, which offers plenty of scope, is based on London. Right salary will be paid for the right man. Box No. 8407, Electrical Times. (C 44)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

West Indian Engineers who are interested in careers with the Trinidad and Tobago Electricity Commission are invited to write to the Secretary and Personnel Manager, P.O. Box 121, Port-of-Spain, Trinidad, West Indies. There are good opportunities for young West Indian Nationals with degrees in Electrical or Mechanical Engineering or who are Graduate Members of the Institution of Electrical Engineers. Commencing Salary £1,050 per annum. Experience not necessary but candidates **must** be qualified. (C 124)

AREA REPRESENTATIVES

not afraid of some blood, sweat and tears, required for the following areas: Greater London including Essex, Midlands including Home Counties, South of England including Wales. The Company is well known to the Electricity Area Boards and Electrical Contractors and are about to introduce new products. Applicants must be between 24 and 30, well educated and preferably with electrical sales experience. Car provided, generous salary and commission. Interviews held in London, Birmingham and Bristol. Apply in writing to:

Sales Director, Cable Covers Ltd., Power Engineer's Equipment Division, St. Stephen's Hse, Westminster, London S.W.1.

(C 142)

AUCKLAND METROPOLITAN DRAINAGE BOARD

requires

ELECTRICIANS AND FITTERS

in NEW ZEALAND

Men are required with experience in the erection and maintenance of mechanical or electrical plant which includes pumps, compressors, motors, switchgear and control gear, cabling, instrumentation, etc.

Passage paid, three-year contract, preference for single men.
For full details apply:

J. D. and D. M. Watson, 67 Tufton St, London S.W.1. (C 128)

ELECTRICAL ENGINEER

The Cable Makers Association invite applications from electrical engineers for a vacancy in their Technical Department. Knowledge of rubber and plastic wiring system cables and/or mains cables essential. Experience in cable testing, calculation of current ratings and cable dimensions desirable. Ability to write concise minutes and reports and to draft specifications will be required.

Applications, which will be treated in confidence, giving full details of age, qualifications, experience and salary required should be addressed to The Director, Cable Makers Association, High Holborn House, 52-54 High Holborn, London W.C.1. (C 127)

'ENGLISH ELECTRIC'

require Senior Designer Draughtsmen

in the General Engineering Projects Department, London, which is concerned with the design of conventional Power Stations and other large Engineering Works. Applicants, preferably aged 30-40, must possess a sound practical background, coupled with several years' design experience in Power Station engineering or associated subjects, i.e., Electrical: power circuits, protection equipment, large rotating machines, etc.; Mechanical: steam turbines, steam process equipment, pipework, hydraulics, etc.

These are senior posts calling for responsibility and initiative and carry attractive salaries for those with relevant experience. The positions are permanent and pensionable; good working conditions, staff restaurant. Please write or call (in all cases quoting reference number ET.599A):

THE TECHNICAL PERSONNEL OFFICER,
DEPARTMENT G.P.S., ENGLISH ELECTRIC HOUSE, STRAND, LONDON W.C.2.

Telephone number COV 1234, *extension* 262.

(C 141)

An

ELECTRICAL TECHNICIAN

is required

in our Electric Motor Department. Must be familiar with the design and manufacture of all types of Electric Motors. Must also be expert in handling various types of switchgear used in complex electrical circuits such as are found in modern machine tools. A house will be provided for applicant who proves satisfactory.

MURAD DEVELOPMENTS LTD., QUEENBOROUGH, KENT

(C 158)

NORTH THAMES GAS BOARD

ENGINEER/DESIGNER (ELECTRICAL)

REQUIRED to take charge of the electrical engineering section of the Chief Engineer's Department Drawing Office and to be responsible for the preparation of drawings, schemes and specifications for electrical work at the Board's various Works.

Applicants, who should be not less than 35 years of age, must be corporate members of the Institution of Electrical Engineers with good experience in heavy electrical engineering, and in the application of telemetering and remote control equipment.

The starting salary will be between £1,600 and £1,850 per annum according to experience, and the successful candidate will be required to join the Board's contributory pension scheme.

Applications giving full details should be sent within 14 days of the appearance of this advertisement to the Staff Controller, North Thames Gas Board, 30 Kensington Church St, W.8, quoting reference ET/1057.

(C 162)

CENTRAL ELECTRICITY GENERATING BOARD

NORTHERN PROJECT GROUP

Applications are invited for the vacancies at Northern Project Group Headquarters, Agecroft, for:

THIRD ASSISTANT ENGINEERS (PROGRAMMES)

Salary range £1,320/£1,610 per annum.

Applicants should have had some experience in the construction of Power Stations or similar large scale engineering projects. Experience in design and layout of such projects will be an advantage and experience of programming is desirable but not essential.

These appointments provide an excellent opportunity for young Engineers to gain an insight into the problems involved in major construction projects, especially those stemming from the conflicting demands of Civil, Mechanical and Electrical Engineering Contracts.

Membership, or qualification leading to membership, of an appropriate professional institution would be an advantage.

Application forms available from the Administrative Officer, Central Electricity Generating Board, Northern Project Group, Agecroft Rd, Pendlebury, Swinton, Manchester, to be returned by 29 Sept., 1961, quoting Ref. N.90/F.

Envelopes should be marked: "Confidential—Vacancy."

(C 134)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment:

BEDFORD GENERATING STATION

STATION SHIFT CONTROL ENGINEER

(S.V. No. 1530)

Salary: N.J.B. Class D, Grade 10, Scale 3, £715/£805 per annum, plus £90 Shift Allowance.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a switchboard at a generating station and be fully conversant with high voltage switching operations and protective systems.

Applications, quoting Reference S.V. No. 1530, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 30 Sept., 1961.

F. W. SKELCHER,
Assistant Regional Director.

(C 144)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Warwick Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.7, £965/£1,090 per annum, plus 10% shift allowance.

Applicants should have a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications will be an advantage.

Apply, quoting vacancy number 244/61 MD, on form A.E.6, available from the Station Superintendent, Warwick Power Station, Emscote Rd, Warwick, to whom they should be returned to arrive by 2 Oct., 1961.

(C 133)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointments:

GENERAL ASSISTANT ENGINEERS

GOLDINGTON GENERATING STATION

(BEDFORD)

(S.V. No. 1543)

Salary: N.J.B., Class H, within the range of Grades 16/14, Scales 1/3, £625/£805 per annum, plus £90 per annum Shift Allowance whilst engaged on shift duties.

The commencing salaries will depend upon the duties and responsibilities.

Duties of the above post include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house, and turbine house plant, testing, etc., in a generating station and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be an advantage.

Applications, quoting Reference S.V. No. 1543, stating age, qualifications, experience and present position, should be sent to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 30 Sept., 1961.

F. W. SKELCHER,
Assistant Regional Director.

(C 143)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

GENERAL ASSISTANT ENGINEER

REQUIRED in the Site Maintenance Department for the Hams Hall Group of Power Stations, nr. Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade N.17, £825/£940 per annum.

The appointment is permanent with excellent opportunities for advancement. It is necessary that applicants should have received a sound technical training and should preferably have had some industrial engineering experience and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting vacancy number 247/61 MD on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks, by 2 Oct., 1961. (C 161)

ADEN GOVERNMENT

Electricity Department

ASSISTANT CONSUMERS' ENGINEER

REQUIRED on contract for one tour of 18-24 months in first instance.

Commencing salary according to age and experience in scale (including Inducement Allowance), rising to £1,905 a year. Gratuity at rate of 12½% of total salary drawn. Free passages. Outfit allowance £60. Children's education allowances.

Secondment from a Home Area Board may be possible in certain circumstances.

Candidates should possess H.N.C. in Electrical Engineering or equiv., and have had technical training and experience in utilisation of electrical energy in industrial, commercial and domestic premises.

Apply to CROWN AGENTS, 4 Millbank, London S.W.1. for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51004/EE. (C 126)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. Schedule A appointments in the South Wales Division:

ASSISTANT MAINTENANCE ENGINEER

(ELECTRICAL)

CARMARTHEN BAY POWER STATION

BURRY PORT, CARMS.

Vacancy No. 265/ET/61.

Salary: Class K, Grade 8, Scale 11, £1,275/£1,410 per annum.

Applicants should possess H.N.C. or equivalent qualifications and should have had wide experience in power station electrical maintenance.

The successful candidate will be required to assist the Electrical Maintenance Engineer and the Planning Engineer.

PLANT CONTROL ENGINEER

USKMOUTH "B" POWER STATION

WEST NASH, NEAR NEWPORT, MON.

Vacancy No. 266/ET/61.

Salary: Class K, Grade 10, Scale 9, £1,115/£1,245 per annum, plus 10% shift enhancement.

Experience of operation of modern high pressure and temperature reheat unit plant desirable.

The successful candidate will be required to supervise the operation of units, to achieve maximum thermal efficiency and safe operation. H.N.C. or equivalent qualifications are essential.

Special application forms are obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 7 Oct., 1961.

(C 159)

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

LITTLEBROOK POWER STATION

ASSISTANT ENGINEER (EFFICIENCY)

Vacancy No. 247/61.

THE successful applicant will assist in the Station Efficiency Section in investigations into the thermal performance of plant. Technical qualifications to H.N.C. standard are desirable and practical experience in generating station work would be an advantage.

Salary: N.J.B. Class 11, Grade 14, £940/£1,065 per annum, including London Allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Littlebrook Power Station, nr. Dartford, Kent, to arrive by 6 Oct. (C 146)

Eastern Electricity

Northmet Sub-Area

(a) DISTRICT COMMERCIAL ASSISTANT

ST. ALBANS DISTRICT

(Ref. 1082) 199/61.R.

(b) SENIOR SALES REPRESENTATIVE

ST. ALBANS DISTRICT

(Ref. 828) 200/61.R.

CANDIDATES for (a) should be fully experienced in modern installation practice, able to prepare specifications and competitive quotations and be competent to design thermal storage heating schemes particularly floor-warming. A sound knowledge of tariffs and their application including supply by special agreement is necessary.

Candidates for (b) must have had a sound practical training with experience in electrical installation work for domestic and commercial premises. A good knowledge of electrical water heating and ability to prepare wiring specifications and estimates is required with an all-round knowledge of and an ability to sell domestic electric appliances.

Salary: (a) N.J.C. Grade III (£780/£880).
(b) N.J.C. Grade II (£700/£775).

Apply by letter to F. J. Drake, ASSOCIATE I.E.E., Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, Herts, by 2 Oct., 1961. (C 147)

RHODESIA CONGO BORDER POWER CORPORATION LIMITED

KITWE, NORTHERN RHODESIA

TECHNICAL ENGINEERS

APPLICATIONS are invited from qualified Electrical Engineers (Degree or Corporate Membership) for the position of Technical Engineer on the Corporation's Engineering Staff at Kitwe, Northern Rhodesia, the operational centre of its 220 kV and 66 kV networks.

Applicants should be preferably in the age group 28-38, having had at least five years' experience in the electricity supply industry or in the manufacture of apparatus related to the supply industry.

The duties will include:

1. Calculations related to system load studies, protective gear settings, maximum short circuit evaluations, including the use of a d.c. analyser board. Experience in tariff computations would be an advantage.

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continued in next column

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The commencing basic salary will be in the region of £1,800/£2,000 (Rhodesian currency) per annum, dependent on experience. The successful applicant will participate in the Corporation's Bonus Scheme. The rate of bonus is related to the prosperity of the Copper Mining Industry. The present rate is 36½% of basic salary. Housing (including basic heavy furniture) will be provided at a sub-economic rental.

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The Secretary, Rhodesia Congo Border Power Corporation Ltd., P.O. Box 819, Kitwe, Northern Rhodesia, not later than 15 Oct., 1961. (C 130)

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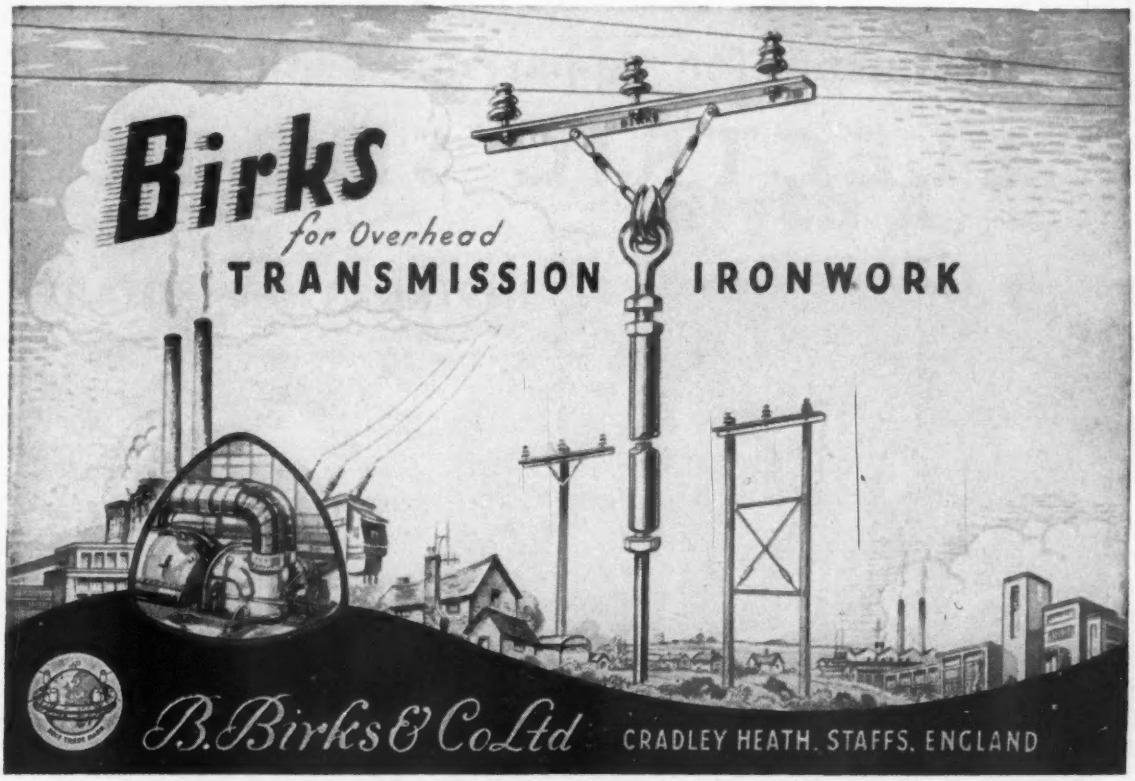

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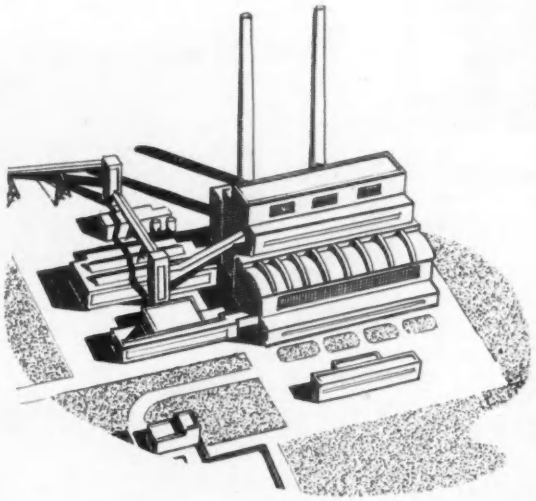

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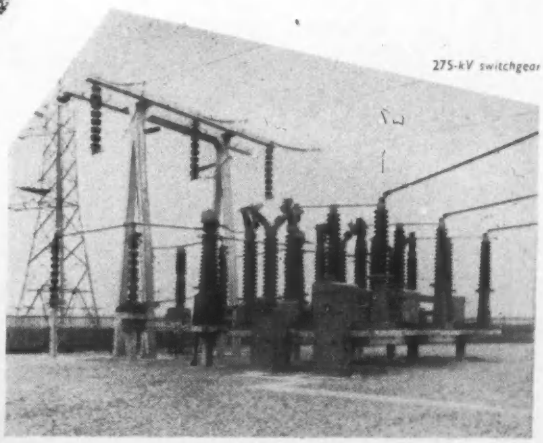

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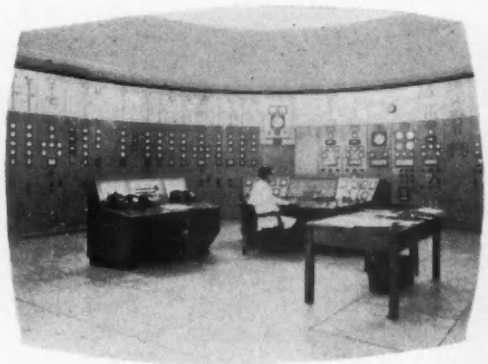

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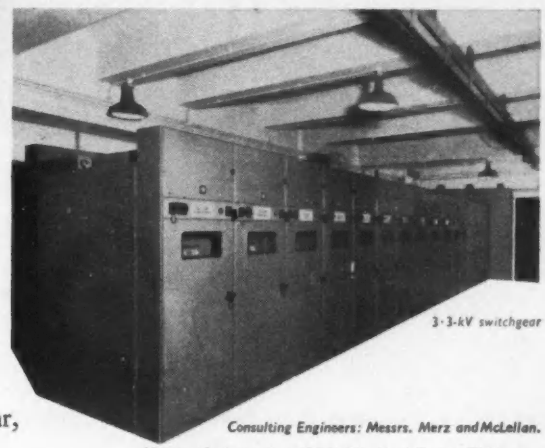

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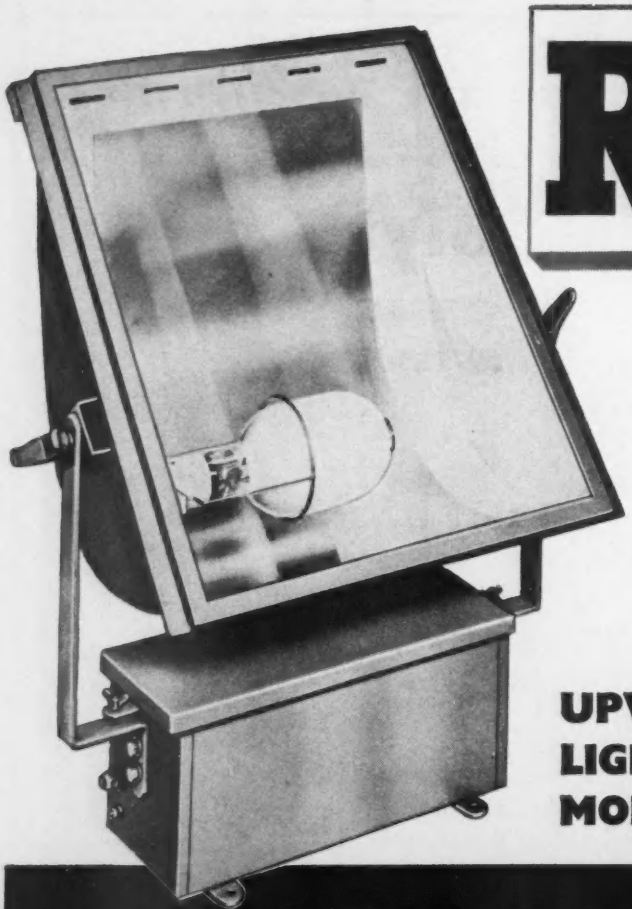

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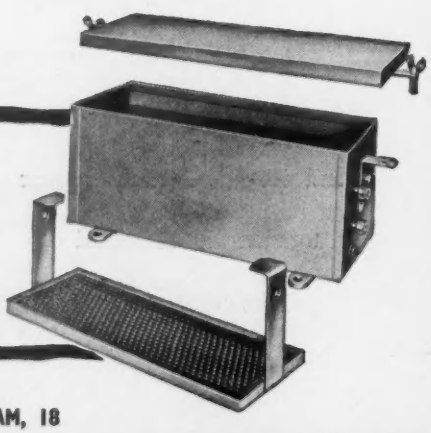

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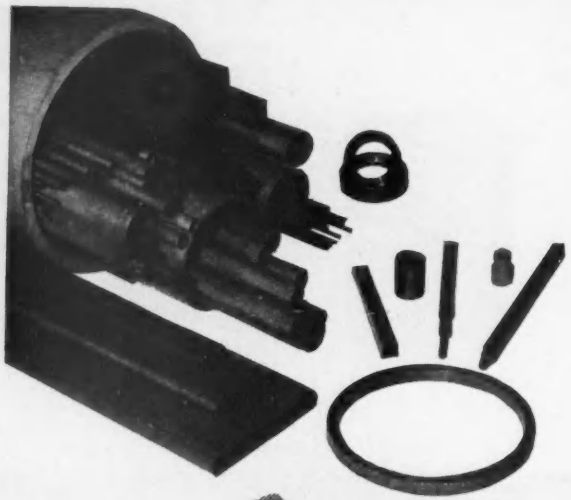

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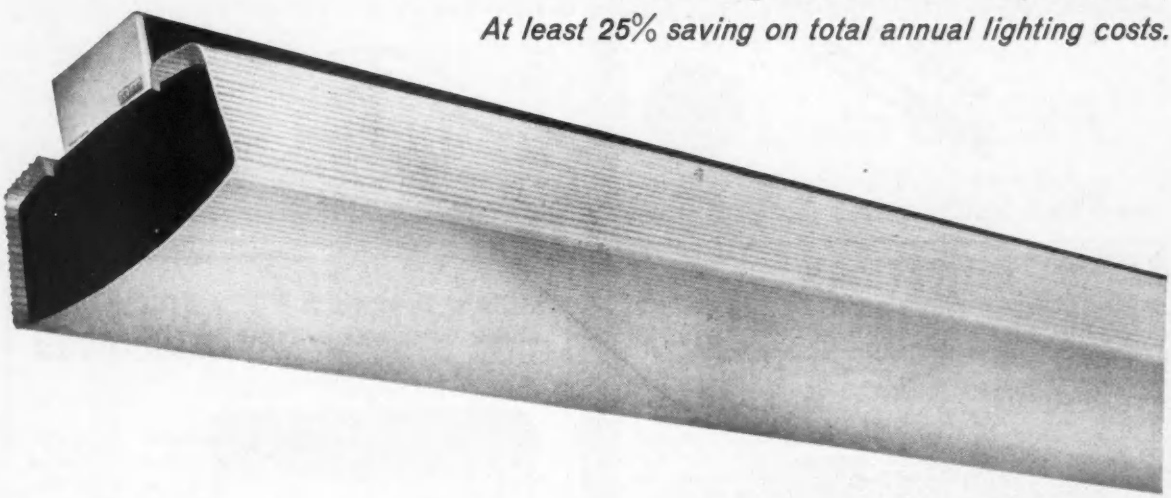

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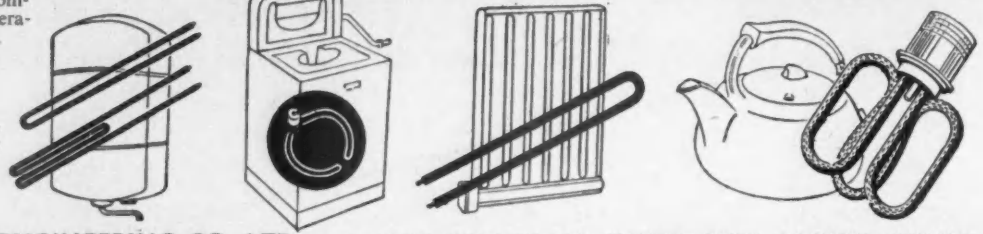

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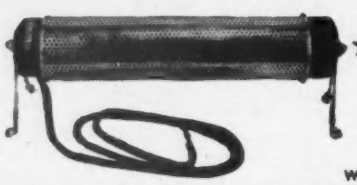

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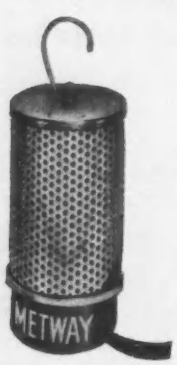

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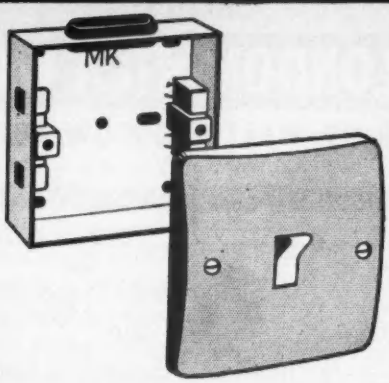

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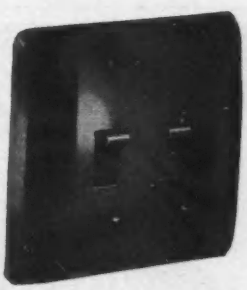

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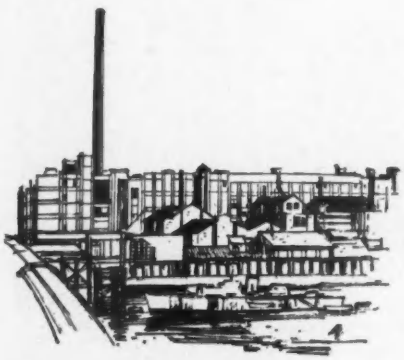

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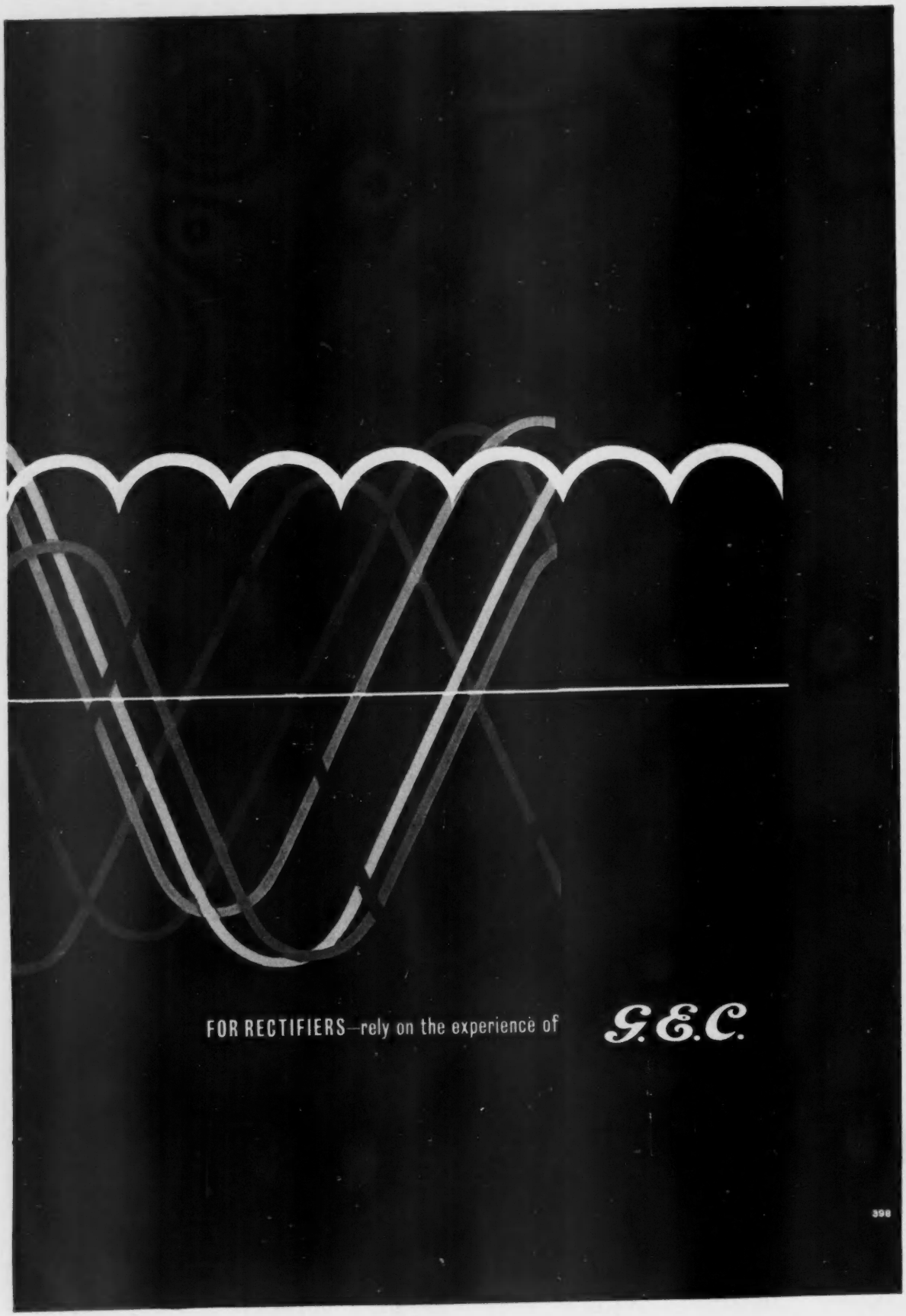
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